

PUBLIC WORKS

July
1956

CITY, COUNTY AND STATE

Front-Foot Benefit Charge
—Who Pays for
MAJOR IMPROVEMENTS?
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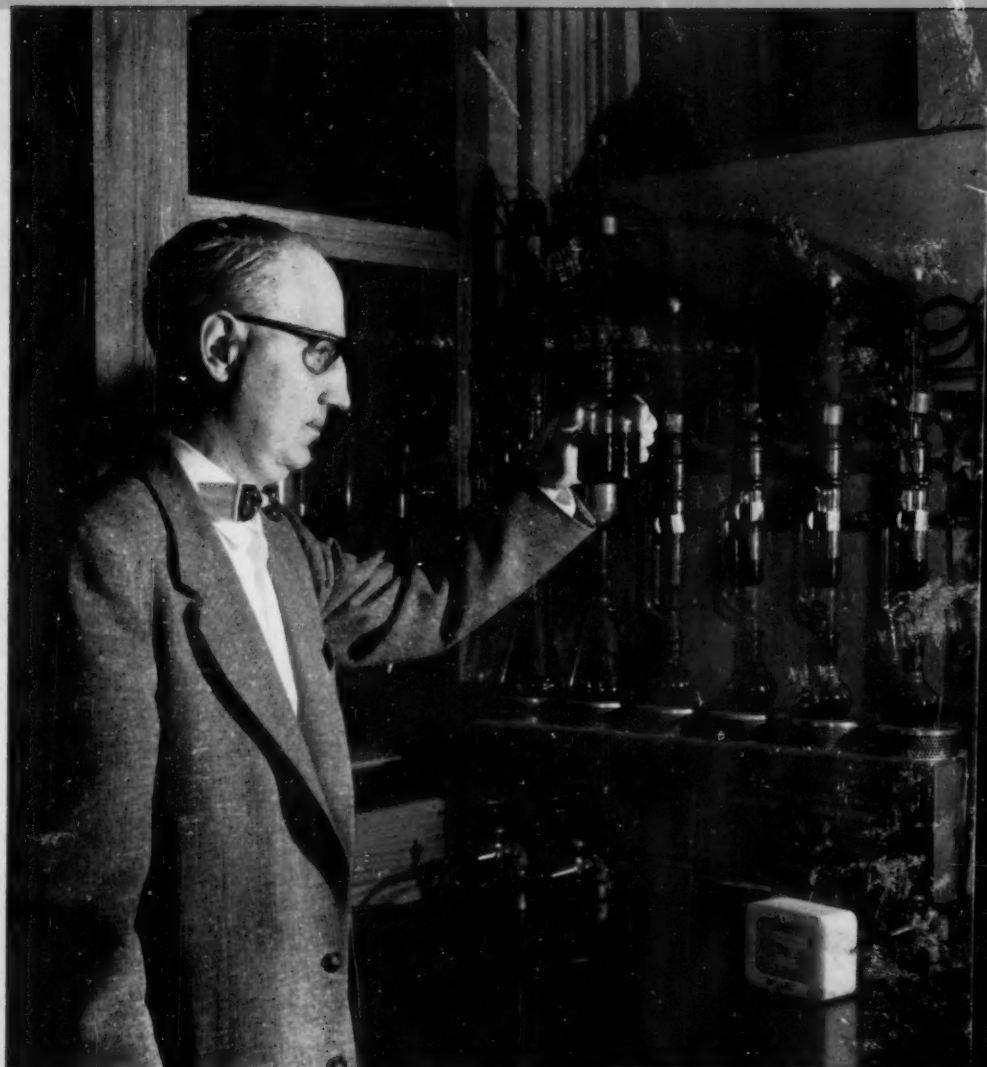
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Ladis H. Csanyi is professor of Civil Engineering, Iowa State College, and also he bituminous research. More on page

UNIVERSITY MICROFILMS
SIS N 1ST ST
ANN ARBOR MICH
M-4

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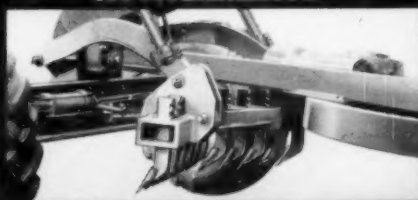
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A heavy-duty power take-off is connected direct to the engine crankshaft of grader through V-belt drive and disc clutch controlled from grader cab. This control is furnished with the attachment. All other operations utilize the standard hydraulic controls on your GALION Grader. The standard 16-ft. carrier is easily extended by inserting one or two 3-ft. sections. This attachment is easily removed to convert grader for normal operation.

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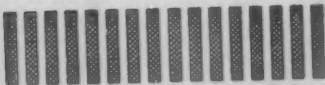
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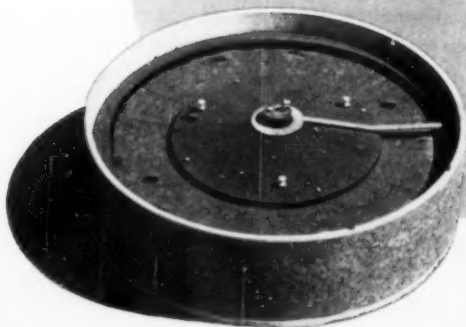
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through
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solids loading for
sludge digestion

RESULTING IN:

1. Smaller tanks
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3. Non-formation of dense floating solids, termed "scum", eliminating former pro-ration of digester volumes for holding "scum".
4. Consistently highest degree of volatile solids reduction and gas production—through fundamental application of a simple gas diffusion mechanism—with lowest tank volume and simplified piping, without increase in operation supervision requirements.

*Exclusive of sludge storage volume that may be required by subsequent disposal methods.



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Reports describing the PROCESS in detail are available on request. Write to Department F.

* Patents Applied For



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"JUST RIGHT"

FOR DOUGLAS, ALASKA



As in many other communities, from Alaska to Florida, the Caterpillar No. 212 Motor Grader has given the City of Douglas exactly what it needs.

Against the rugged backdrop of Mt. Juneau, the machine is shown here maintaining Douglas' Fifth Street. A. J. Balog, Superintendent of Streets, says:

"Our No. 212 is just the size we wanted and fits our requirements perfectly. It steers and handles easily and will do all-purpose work. We cut banks and ditches, maintain two miles of gravel street and one mile of the black-topped main street. In winter we get drifts three to four feet deep, and we use the snow plow attachment to clear the roads. All in all we're sure pleased with our No. 212 Motor Grader."

In choosing the machine the city looked for two things. They wanted the versatility that would do any job well, and the local service they knew they would get from their Caterpillar Dealer.

The No. 212, with its dependable four-cycle, 50 HP Cat Diesel Engine, is a well-balanced grader, capable

of doing just about anything the larger machines can do, but at slightly slower speeds. Ease of control, good job visibility and accurate blade positioning without leaving the cab are features praised by operators. Like all new Caterpillar Motor Graders, the No. 212 now has tubeless tires, eliminating costly tube and flap trouble and reducing tire down time by as much as 80%.

Get an on-the-job demonstration today from your Caterpillar Dealer and find out how this machine, backed by his excellent parts and service facilities, can save money for your taxpayers.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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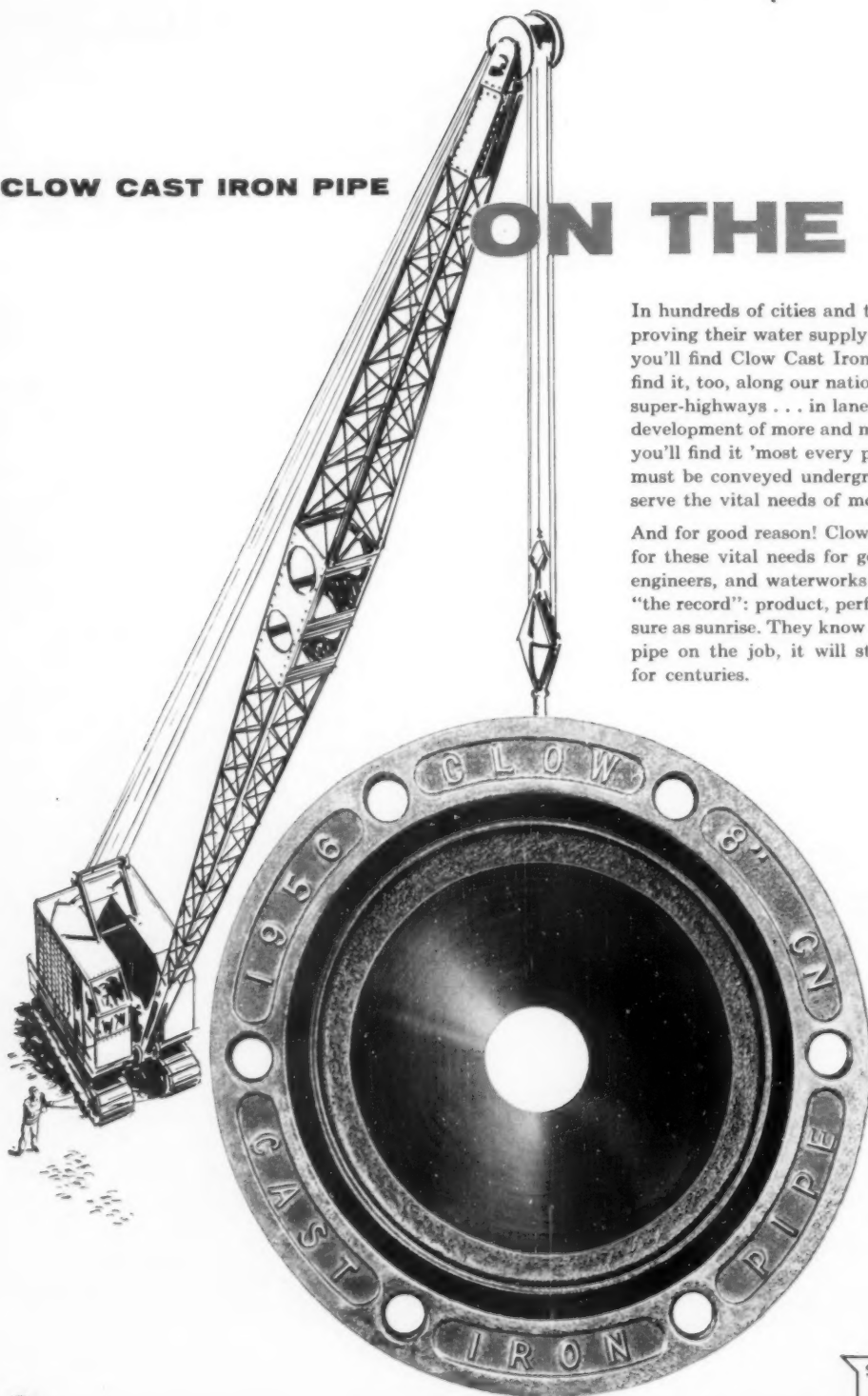
THE MOST USEFUL ENGINEERING MAGAZINE
FOR CITIES, COUNTIES AND STATES

CLOW CAST IRON PIPE

ON THE JOB

In hundreds of cities and towns expanding and improving their water supply and distribution service, you'll find Clow Cast Iron Pipe on the job. You'll find it, too, along our nation's newest toll roads and super-highways . . . in lanes and by-ways . . . in the development of more and more communities. In fact you'll find it 'most every place . . . wherever water must be conveyed underground, under pressure, to serve the vital needs of modern life.

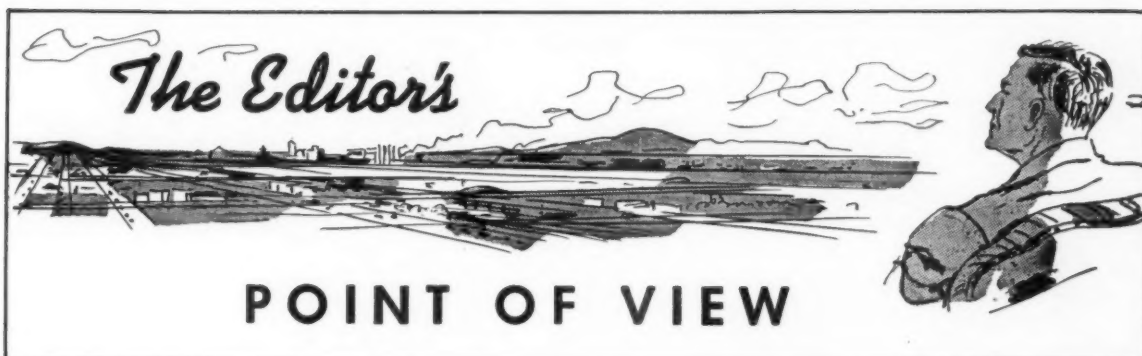
And for good reason! Clow has been supplying pipe for these vital needs for generations. City officials, engineers, and waterworks men like what they call "the record": product, performance-proved; service, sure as sunrise. They know that when they put Clow pipe on the job, it will stay on the job—to serve for centuries.



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Some Hope for MSC Sanitary Engineers from Union with Veterinary Corps

SUDDENLY IT has been discovered by the higher-ups that there are more officers and men in the Veterinary Corps than there are animals in the Army; and the same applies to the Air Force. This is not surprising to anyone up to date in his knowledge of Army and Air Force organization. The needs for veterinary service for animals have long since disappeared, except for caring for pets; but the "Vets" can be of great value in food, milk and meat inspection, an essential preventive medicine service of the Army and Air Force. The personnel needs, however, do not justify its existence as a separate corps, and have not for a long time. Only the pressure of the national veterinary associations has kept it a separate entity thus far.

It is past time to merge the Veterinary Corps and the professional elements of the Medical Service Corps into one scientific corps which will have professional understanding, leadership and inspiration. It will take a long time to undo the regression of the past ten years of the MSC, so far as the professional men in it are concerned, if it can be done at all. Whatever hope there is for the future lies in the union of the engineers and other scientific personnel of the MSC with a strong and understanding group, such as the Veterinary Corps, which has the same general standards of education and training. We hope that such a professional corps can be formed, leaving to MSC the non-professional work which it can do so well, but providing a new, larger, stronger and more useful group for truly preventive and health protective work.

Governmental Aid for Scientific and Engineering Training

CURRENT SHORTAGES of engineers and scientists have at last stirred Congress to action and a number of bills have been introduced that propose to provide assistance in training or otherwise improve the position of such men. Among these are the allocation to various agencies of more and higher paid positions for scientific and professional personnel; government-paid higher technical education for those

assigned to complex and highly specialized jobs; and some needed changes in Defense Department technical personnel policies.

It is past time that the same consideration should be given to the needs and values of engineers as has been given in the past to other professional groups—doctors, for instance. The main difference has been that the doctors had a spokesman and a strong and united association to back up their proposals; but the engineers had neither.

These Big New Shopping Centers Have Public Works Problems

FEW COMMUNITIES do not have a big new shopping center just outside of the corporation limits, or one in prospect. In effect, these shopping centers are communities of their own; and they bring into service all of the skills of public works engineering. After construction, there is pavement for the customers—parking areas; and because of the tremendous traffic generated at such places, main roads and access roads are necessary as well as traffic signals and signs. For night shopping, there must be adequate lighting for safety and to facilitate traffic.

Water supply is, of course, a "must" and this brings on the matter of liquid waste disposal, with a sewer system and a treatment plant. In most cases, perhaps, a high degree of treatment will be necessary for these liquid wastes. The solid wastes likewise need consideration. A contractor may handle the collection problem, but what about disposal? Because of many considerations, size among them, this seems a place where sanitary fill can operate well.

Since all of these operations are outside of the municipality, a big question is who will be responsible. We have pointed out previously that, in many states, counties lack the power to control conditions of this nature in unincorporated areas except through the often cumbersome procedure of forming a sanitary district. At any rate, the problems posed ought to be high on the agenda of state and county boards of health, with at least a weather eye on the preparation of legislation which will be adequate for these problems, and for others of a similar nature that are certainly going to arise in the future.

You play safe when you lay



River crossing of cast iron pipe line to carry sewage to disposal plant at Portland, Oregon.

Installation of mechanical joint cast iron pipe for gas distribution at Syracuse, Nebraska.

Cast Iron pipe has long been recognized throughout the engineering profession as a rugged and adaptable material with proved ability to survive beam, compressive and shock stresses. Today's *modernized* cast iron pipe—centrifugally cast—is even tougher, stronger and more uniform in quality. Its effective resistance to corrosion, plus high strength factors, ensure long life with minimum maintenance cost. Yes, you play safe when you lay cast iron pipe—from your own standpoint and that of the taxpayers you serve. For further information, write Cast Iron Pipe Research Association, Thomas F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Illinois.



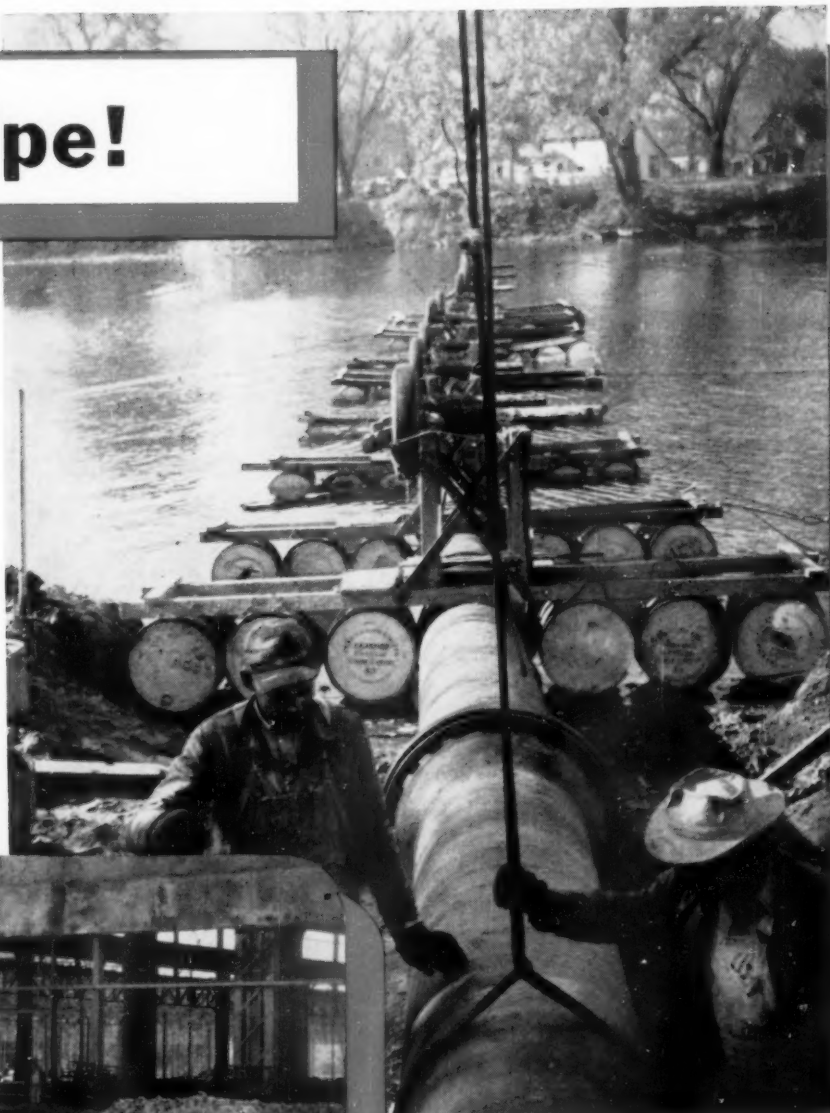
The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.



About a half-mile of 49-year-old 24" cast iron pipe dug up, cleaned and re-laid by Cincinnati, Ohio, Water Department.

CAST IRON PIPE

this pipe!



Flexible joint cast iron pipe being installed across Cedar River at Cedar Rapids, Iowa.



Cast iron pipe for large automobile assembly plant in New Jersey.

SERVES FOR CENTURIES...



"Asphalt proved economical... for Atlantic City's growing traffic loads," says Major William E. Casey, Public Works Commissioner, Atlantic City



"Asphaltic pavement permitted excellent construction speed," says Mr. George Swinton, City Engineer, Atlantic City

Repaved with ASPHALT

Traffic rolls again in 48 hours!

Atlantic City renews main artery with minimum business loss . . . 3 blocks at a time every 2 days

Asphalt construction is the speediest way to repave.

George Swinton, City Engineer of Atlantic City, does it three blocks at a time . . . based on a laying rate of 1200 tons/day. Like this:

First Day . . . barricade three blocks; jack-hammer out worn portions of old paving; fill holes, burn; apply tack coat; lay and roll a 2" asphalt fine-aggregate base; start laying 1½" asphalt wearing surface.

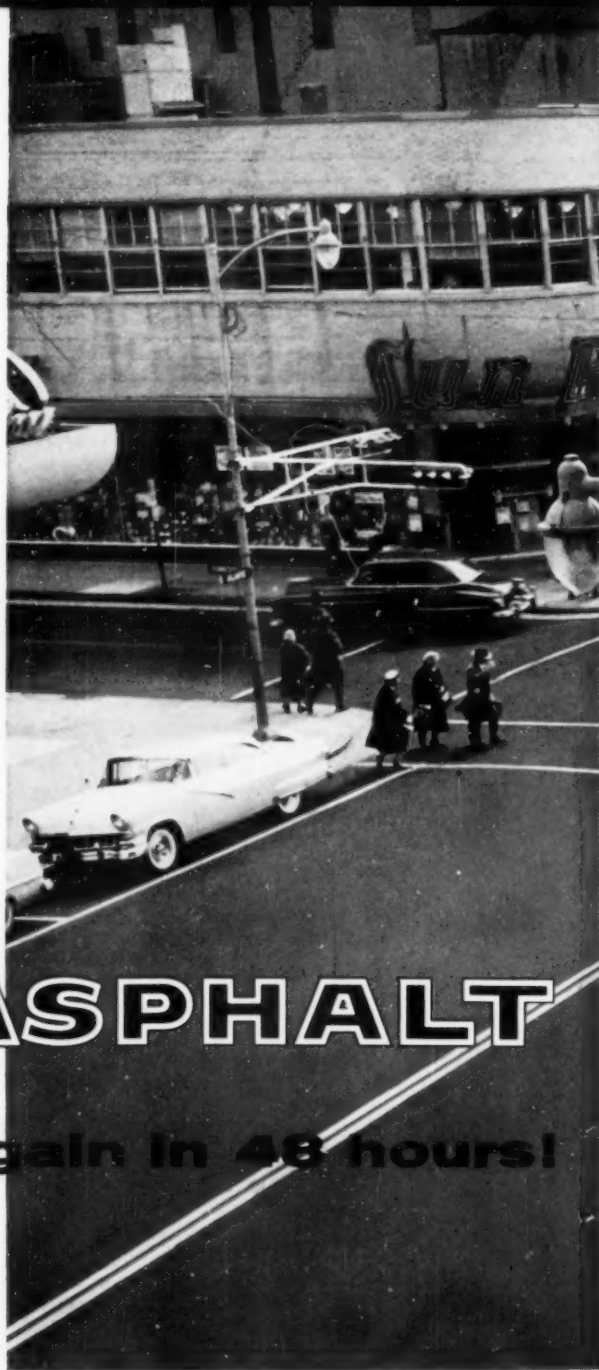
Second Day . . . finish to grade; paint traffic markings; organize equipment and materials for next day's start; open section to traffic.

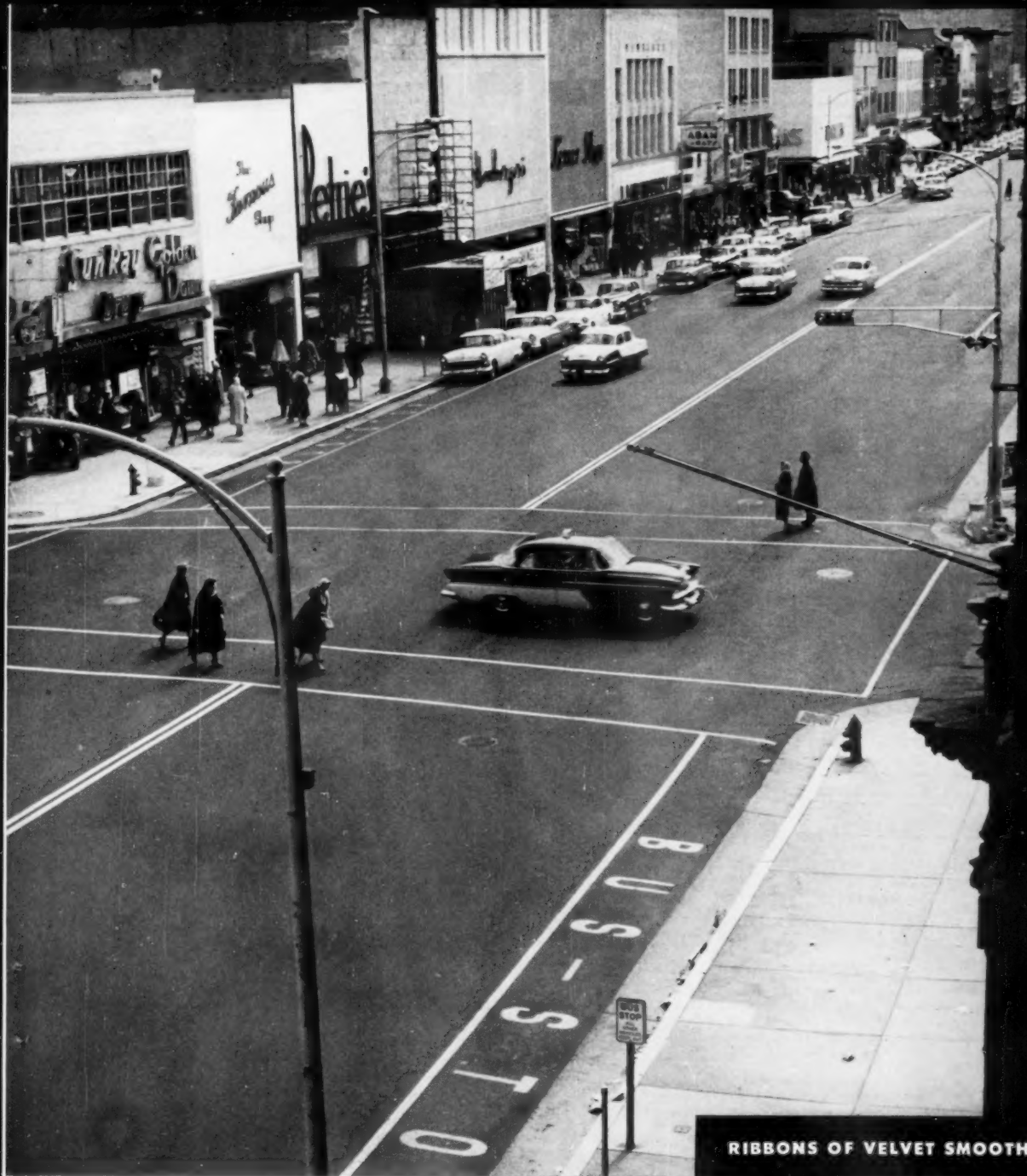
Using this fast-moving asphalt method, the city

repaved its famed 3.1-mile Atlantic Avenue (see photo) weeks ahead of both schedule completion date and resort season. Furthermore, interruption to the business of Atlantic Avenue merchants was scarcely more serious than that of a rainy day.

What's more, with asphalt, cost was low . . . as Mr. Casey, the city's Public Works Commissioner, indicates above. Low first cost. Reduced "mortgage" on future taxes, too. For asphalt is a minimum-maintenance pavement. Smooth. Resilient. Tough. Good for years. Lends itself well to patching after utility tear-ups.

You are in a good strategic position when you plan for asphalt construction. Good with the public.





RIBBONS OF VELVET SMOOTHNESS...

Good with fund watchdogs. Good from the standpoint of sound engineering. Asphalt makes new paving or repaving programs easier to swing.

For an informative booklet, write for "From the Ground Up." For planning help, call for an Asphalt Institute Engineer. At the address below.

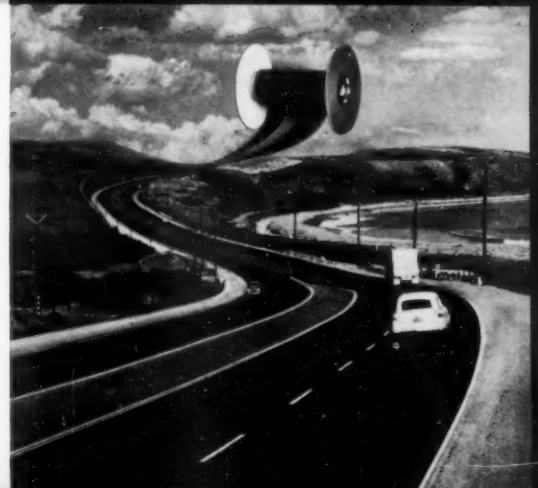
MODERN

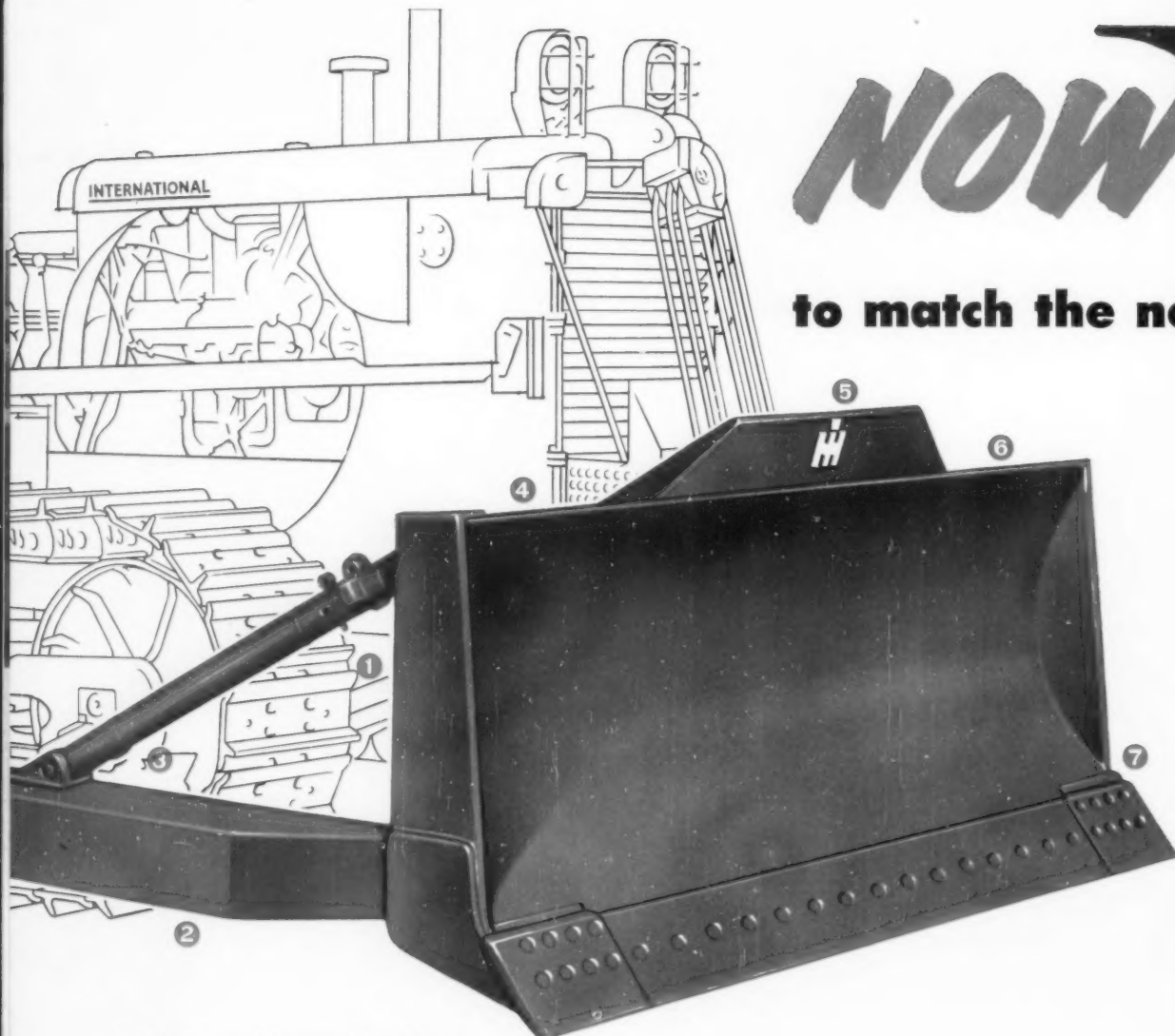
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HIGHWAYS



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NOW.

to match the new

① Side plates are of abrasion resistant high strength steel, securely fused to moldboard and box sections by low-hydrogen welding. They prevent load spillage, allow you to carry larger loads. Standard on all International bulldozer blades.

② Push arms are sturdily constructed of box sections. Side plates are mill-rolled with integral back-up bars to support top and bottom plates. Machine welding guarantees uniformity of weld.

③ Headless pins, locked by eye bolts, secure struts to blade. For removal, pins can be driven out in either direction. On hydraulic blades, all control linkage is connected to the blade through self-aligning bearings.

④ Entire perimeter of blade is backed by heavy box channels solidly fused to moldboard. With this type of construction

moldboard, box channels, and welds flex freely to prevent weld failure.

⑤ Spillboard is wide and high to prevent spillage over top of blade. Note that it is curved to match the contour of the moldboard, thus aiding boilling action. Width of moldboard allows you to carry full load for which the blade was intended.

⑥ Moldboard is formed from a single sheet of low-alloy, high-strength steel. International blade is shaped to perfect curvature in a special forming machine to assure uniform strength and stress resistance over entire area.

⑦ Shear bars welded to moldboard support end bits and relieve stress on end bit bolts. Lower edge of end plate is reinforced by wear plate to add strength at corners, increase wear resistance.

New blades designed from "ground" up

To make full use of the greater work capacity of the new Bonus-Powered International crawler tractors, we now offer a complete line of newly designed blades matched to tractor power.

These new blades are rigidly supported around the edges by box sections to give the blade strength but also permit the moldboard to "breathe" under load stresses. New automatic welding processes guarantee that the welds in International blades will hold up under *any kind of job conditions*.

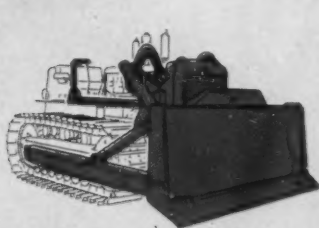
International blades will last far longer and give you far less trouble than any others you have ever hung on any tractor. When you inquire about the new line of Bonus-Powered Inter-

national crawler tractors, ask your International Industrial Power Distributor for all the facts about the new line of matching blades. See for yourself that they are the best designed, best constructed on the market.

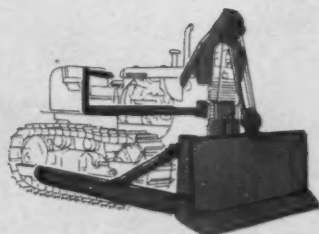
Write For New Blade Literature: An illustrated specification list of the 228 attachments available for International crawler tractors is just off the presses. For your free copy of Mailing Folder CR-492-F, write Consumer Relations Department, International Harvester Company, 180 North Michigan Avenue, Chicago 1, Illinois. No obligation, of course.

.42 new blades

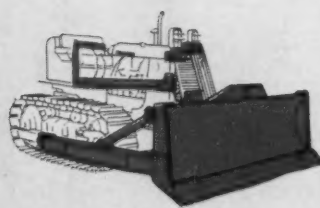
Bonus-Powered International crawlers



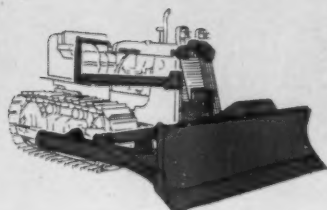
Direct Lift Hydraulic Bulldozer
Operates off front-mounted, gear-driven pump which gives fast blade action. Self-aligning bearings prevent binding of linkage.



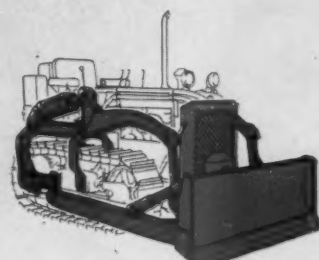
High-Gantry Cable Bulldozer
Operates off either front or rear-mounted International cable control unit. Available for TD-24, TD-18, and TD-14 tractors.



Low-Gantry Cable Bulldozer
Operates off either front or rear-mounted International cable control unit. Available for TD-24, TD-18, and TD-14 tractors.



Hydraulic or Cable Bullgrader
Operates off high or low gantry, front or rear cable controls on TD-24, TD-18, and TD-14 tractors. Hydraulic bullgrader also for TD-9, TD-6, and T-6 tractors.



Track Frame Mounted Bulldozer—Distributes the load evenly over the length of the tracks. Available only for TD-9, TD-6, and T-6 tractors. Bullgrader also available.



International Drott "4-in-1"
Newest of International Drott loaders. Combines Skid-Shovel, Bullclam, clamshell, and bulldozer in one unit. Available for TD-14, TD-9, and TD-6 tractors.



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700-TON

USS STRUCTURAL STEEL FRAMEWORK

The Structural Steel framework nearing completion. The 700 tons of Structural Steel were fabricated and erected by American Bridge.

All connections between Structural Steel members were made with high tensile bolts. This not only speeded-up erection, but made the job unusually quiet.

**— erected
in only
5 weeks !**



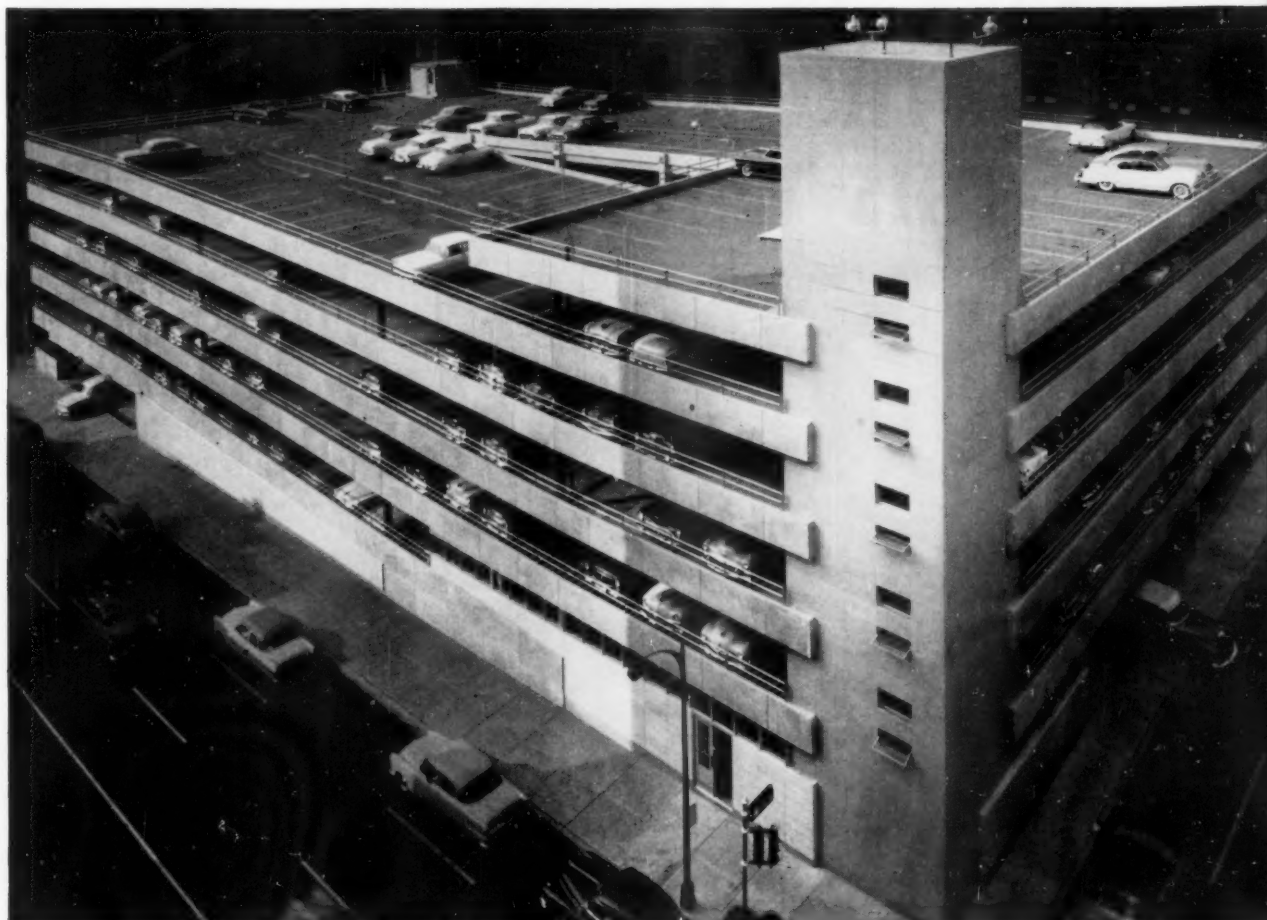
This ultra-modern, rampless parking garage—one of the most unusual ever constructed—was erected by the Public Parking Authority of the City of Pittsburgh in a drive to improve downtown parking facilities.

In area, the new garage is 120-feet wide by 220-feet long, incorporating six levels for drive-in parking. The 120' x 125' center section of the structure is on a slope, while the two 120' x 47'6" end sections are level. The slightly tilted floors eliminate the necessity for ordinary driveway type ramps. Parking capacity of the garage is 812 cars.

The total 700 tons of Structural Steel for the framework were erected and field-connected with high tensile bolts in just five weeks. A fast job—true. But Structural Steel has made a habit of setting construction records . . . in *speed*, in *economy*, and in *architectural versatility*. Regardless of what type of municipal project you might undertake; schools, government buildings, or even airports, you won't find a stronger, safer, more practical construction material than Structural Steel. Look at this list of advantages:



FOR UNIQUE 6-LEVEL GARAGE



The completed six-level Allies Parking Garage. DESIGN—Hoffman and Crumpton, A.I.A., and Leland W. Cook, Structural Engineer. PLANNING CONSULTANT—Ramp Buildings Corporation. GENERAL CONTRACTOR—Ragnar Benson, Inc.

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3. Once enclosed in buildings, it lasts indefinitely—requiring no maintenance.
4. Structural Steel may be bolted, riveted, or welded ... can be erected in any weather in which men can work.
5. Steel members are fabricated indoors; therefore, weather can have no effect on the quality of the workmanship.

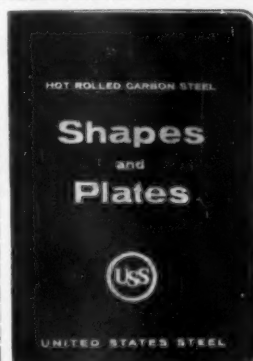
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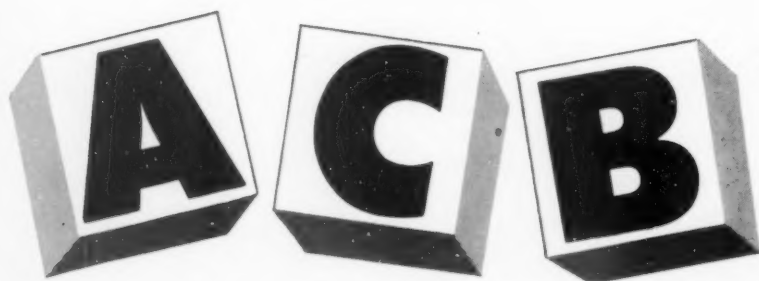
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ACB Primer dries fast, dries hard, bars moisture penetration, and provides a rust-preventing undercoat with remarkable durability. It resists chemicals, fumes and moisture. From air compressors to zeolite tanks, there are 26 surfaces in water and sewage plants where ACB Primer is the ideal foundation for paint finishes, saving up to HALF on new work, a THIRD on repaint work. Write for our ACB Primer Bulletin.



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Maintenance men and paint experts pooled their experience in a group of highly practical painting systems. Report best methods to defeat paint-destroying chemicals, fumes, mildew and excessive humidity on 267 types of equipment and surfaces above and below water. Simplify painting and save money. *Sent free on your business letterhead request — write today!*

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Heavy-Duty Maintenance Paints Since 1883

TROPICAL

SUBSIDIARY OF
PARKER RUST PROOF COMPANY



LETTERS

TO
THE EDITOR



WATER SAMPLES FOR TASTE & ODOR STUDY

Our water research laboratory is most interested in procuring samples of water from all over the nation for study of actinomycetes in water supplies. We request that the samples be approximately 500 cc and that they be composed of water from the water supply with a little mud or organic matter picked up and added to the water. We would appreciate receiving as many samples as individuals are inclined to send us. We will isolate the taste and odor producing organisms and later will send back cultures to the collectors. By this technique, the water works engineer or filtration superintendent will have an opportunity to smell the causative agents that we have isolated for him and come to his own conclusions regarding their importance in producing tastes and odors in his water supply. I hope we get a goodly number of samples and I think the information we will obtain will be most useful.

J. K. G. Silvey,
Chairman, Div. of Science,
North Texas State College,
Denton, Texas.

STATE ENGINEER POSITIONS

Your listing of the salary scales of five State Highway Departments is interesting. However, it needs to go somewhat farther to enable one to judge as to the opportunities for a satisfactory career working for a given organization. There would be no point to starting in with an organization which did not offer an adequate chance to advance to a well-paid higher position.

In the Florida State Road Department, for instance, how many positions are there in the entire state of the classification "Assist. District Engr.; Assist. Engr. of Dept." and higher?

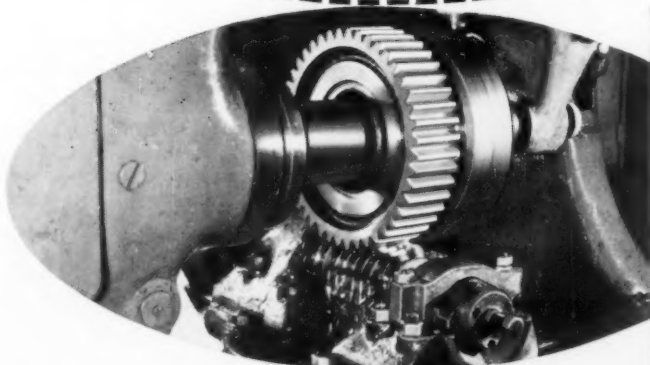
In the Ohio Department of High-

**Important reasons why
it pays to use**

*True Original
Parts*



Allis-Chalmers True Original Parts start right. Each benefits from one of industry's most intensive metallurgical research programs. And each is designed by experienced construction machinery engineers to do a specific job . . . with ample capacity to carry a full share of the work load just as the new equipment part did.



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PRECISION-MADE

Skilled craftsmen bring True Original Parts to life—working with the most modern manufacturing equipment and meeting the highest industrial standards. The result: precision-made parts get full work power from your Allis-Chalmers machinery.



2

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True Original Parts go through rigid original-equipment inspection and testing processes to assure long-life service. For example, gears are checked again and again for perfect meshing . . . for true balance . . . for full capacity.



3

PROPERLY PACKAGED

You want your parts factory-new . . . and that's how you get True Original Parts. Many are specially treated . . . then sealed and packaged against rust, dust and damage.

A country-wide network of dealers stock ample supplies of True Original Parts. Whether you're working in one area or across the country, you can depend on reliable parts service close to your job from your Allis-Chalmers Construction Machinery dealer.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS



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anywhere



the
F & P
Portable
CHLORINATOR

Here's the answer to emergency or field construction chlorination—the Fischer & Porter *portable* chlorinator.

Readily moved by man or boy, it is a reliable stand-by chlorinator; anywhere, anytime. Can be conveniently transported by automobile, by airplane, or on foot to locations inaccessible to vehicles. Contractors find it indispensable for disinfecting new and old pipelines, municipalities use it for standby plant operation, emergency flood or field chlorination.

Employs the same rugged construction and safe, efficient, positive instrument-type controls used so successfully in the larger F&P chlorinators. Fully enclosed in tough, light Fiberglass cabinet, the entire unit is impervious to corrosion. Weighs less than forty pounds. Write today for complete information.

- **SAFETY**—built-in positive acting safety devices.
- **SIMPLICITY**—does not require highly skilled personnel to operate.
- **MAINTENANCE-FREE**—constructed entirely of materials inert to corrosion by dry or wet chlorine.
- **WIDE RANGE**—standard 10 to 1 overlapping flow ranges from 0.1 to 1000 PPD chlorine.
- **EASY TO CHANGE CAPACITY**—Converts to higher or lower flow ranges in minutes without special tools.

Fp FISCHER & PORTER

576 Fischer Road, Hatboro, Pa.

In Canada:
Fischer & Porter (Canada) Ltd.
Toronto 19, Ont.

ways, how many positions are there in the entire state of the classification "Civil Engineer VII" or higher?

Under the Missouri State Highway Commission, how many positions are there in the organization of the classification "Senior Engineer III" and "District Engineer Assistant" or higher?

In California, under the Department of Public Works, how many positions are there bearing the classification "Senior Highway and Bridge Engineer" and higher?

And in the New York Department of Public Works, how many positions are there in the entire state designated "Associate Civil Engineer" or higher?

Equally of interest, though probably difficult to ascertain from the organization concerned, would be information as to how many of the desirable positions are filled by promotion from the ranks, and how many are essentially political appointments.

Harold Nevin Carey
Registered Civil Engineer
2026 North Street
Phoenix, Arizona

• • •

Traffic Engineering Course

A traffic engineering short course will be held at Purdue University August 6 to 10. Theme of the course will be "Engineering Aspects of Traffic Operation." The instruction course is designed for civil engineers from Indiana and nearby states who are interested in obtaining the most efficient use of existing street systems for traffic flow in urban and suburban areas. Special attention will be given to problems in the smaller cities. Further information may be obtained from Professor Don Berry, School of Civil Engineering, Purdue University, Lafayette, Indiana.

• • •

News of Engineers

KENNETH S. WATSON, consultant for the General Electric Co., on water management and waste control, was appointed by the Secretary of State as Engineer Advisor to the United States Delegation to the ninth meeting of the World Health Assembly in Geneva.

E. W. KILPATRICK has become associated with the Boswell Engineering Co., Ridgefield Park, N. J.

ALFRED C. LEONARD has been appointed an associate in the firm of Malcolm Pirnie Engineers, consulting engineers of New York City.

New York State Engineers build road in spite of slashed budget. Bitumuls with local aggregate is selected.

WHEN a drastic cut in appropriations forced the New York State Department of Public Works to reduce a project to a minimum expenditure, they turned to the proved method of Bitumuls-Native Aggregate construction. Based on the experience of several of the counties in the region, they knew this to be a sound method of stretching road-building dollars.



Rotary mixer and Bitumuls tank truck work in tandem to stabilize 4" lift of base aggregate.

The original plan

Airport construction at Riverhead, Long Island forced the relocation of the Wading River-Manor Road. As engineered by the State Department of Public Works, plans for this road originally called for two 24 ft. lanes for a length of approximately 6 miles. Financing, through the U.S. Bureau of Public Roads, struck a snag; and drastic economies were required to keep the job alive. In adjusting to the lower appropriation, it was decided to reduce the project to one 24 ft. lane, of a length allowable under the available monies.

New estimates indicated this would amount to approximately 3.16 miles, and invitations based on this distance were put out for bids. These specifications called for an 8 inch stabilized base, with 1" Asphaltic Concrete surfacing.

Job data

Local selected soil, sand, and gravel blended to meet the following dry sieve specifications were used for

the stabilized base work on this job.

PERCENT BY WEIGHT PASSING		
Sieve	Specification	Aggregate Used
1 1/2" Sieve	100	100
1" Sieve	90-100	84.5
3/4" Sieve	60-80	78.3
1/2" Sieve	30-50	64.2
# 10 Mesh	20-40	50.5
# 40 Mesh	10-30	10.9
# 80 Mesh	7-8	5.6
# 200 Mesh	5-15	3.8
Emulsified Asphalt	5-7%	5.75%

The amount passing the 200 mesh was specified to be not more than one-half the amount passing the 40 mesh sieve.

Aggregate was blended at the pit, approximately five miles from the job site, tested, then trucked to, and spread on, the sub-base. Enough such material for the bottom four inches of the base course was brought in and spread. Bitumuls Emulsified Asphalt, mixing grade, was pumped directly from the transport truck into a Rotary type mixer. This first 4" base course was mixed, rolled, and cured. Aggregate was then brought in for the second 4" course and the process repeated.

Heavy rains encountered

During the construction of the base course, two separate hurricanes interrupted job-progress. Delay was held to a minimum because Bitumuls readily coats damp aggregate, and damage caused by the storm was restricted to exposed areas of the sub-base plus those areas of the stabilized base that were not cured.

Surface course construction

The 8" Bitumuls Stabilized Base was topped with 1" fine aggregate Asphaltic Concrete surface course. Spreading and compaction of this material was accomplished by conventional methods. The surface course was extended 1 ft. on either side of the 24 ft. pavement to provide a degree of shoulder stability. Upon final acceptance, the road was turned over to the town of Riverhead, New York, by the contractor.



Sound paving, with economy... Bitumuls Emulsified Asphalt used with local aggregate

ROAD-BUILDERS throughout the nation have come to recognize the value of Bitumuls® Emulsified Asphalt in holding the cost of road construction to the lowest possible level.

A major factor in this economy: Bitumuls' compatibility with local or in-place aggregates, even though they be hydrophilic. This eliminates costly transportation of imported materials.

Our Engineers, operating out of our nationwide network of offices, will gladly provide complete information on specific grades of Bitumuls for various types of pavement construction.

Bitumuls is used extensively for maintenance work, too. Call our nearest office for complete details.



American Bitumuls & Asphalt Company

200 Bush Street, San Francisco 20, Calif.

St. Louis 17, Mo.	Cincinnati 38, Ohio
Tucson, Ariz.	Inglewood, Calif.
Perth Amboy, N. J.	Baltimore 3, Md.
Mobile, Ala.	San Juan 23, P. R.
Oakland 1, Calif.	Portland 7, Ore.

**LEADING MARKETERS OF
ASPHALTS, CUTBACKS AND
BITUMULS-NATIONWIDE**

Up TO 72"

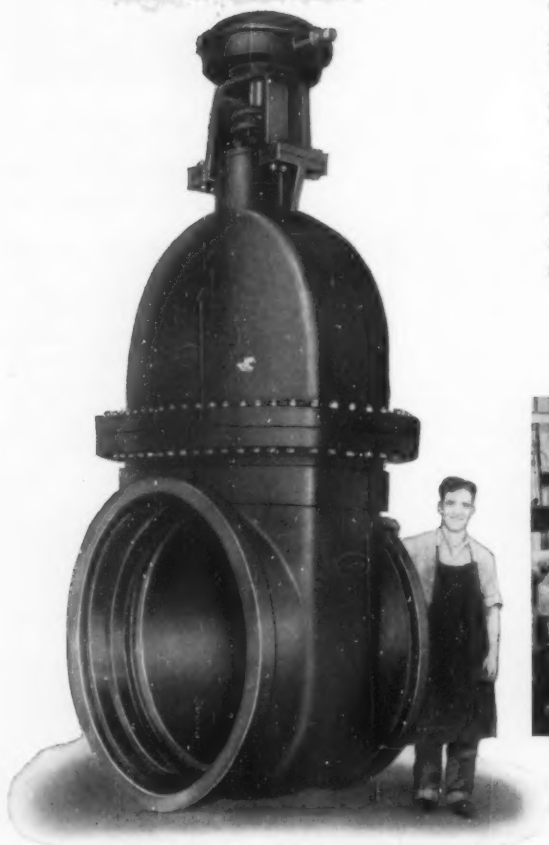
LUDLOW VALVES

The water supply for thousands of people may depend upon a few large valves which must be reliable. Only a huge, specially equipped foundry, backed by giant tools, in a modern precision machine shop can supply this dependability. Ludlow has been the headquarters for large valves for nearly a Century.

LONG LIFE and DEPENDABILITY are built in. Ludlow Valves are fully bronze mounted. The two piece wedging mechanism is simple and rugged. The double disc parallel seat construction results in a wiping action that cleans the seats during the closing operation. The stems are special high tensile strength Ludlow manganese bronze with precision cut modified acme threads.

"NO POSSIBLE DIFFERENCE IN FIRST COST CAN OVERBALANCE THE PERPETUAL ECONOMY OF QUALITY."

17



*Ask for
Bulletin 54 W*

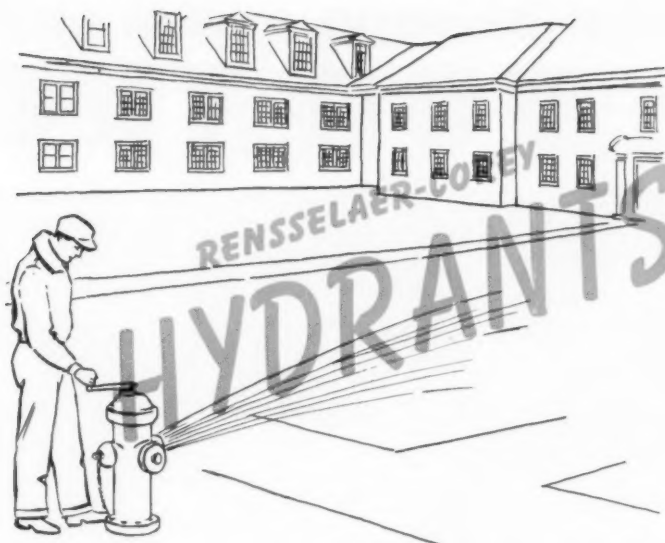


THE
LUDLOW



VALVE MFG. CO., INC. TROY, N. Y.

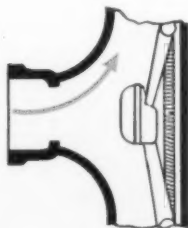
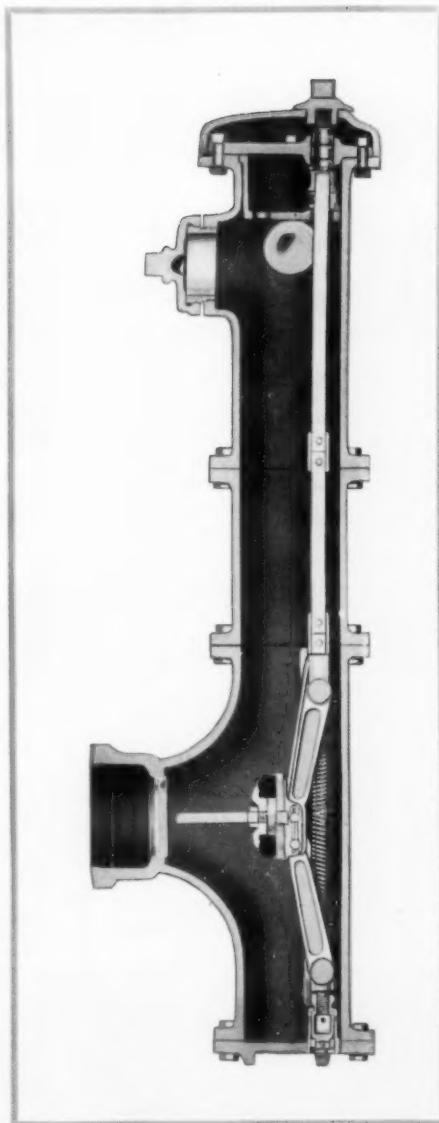
GATE VALVES • FIRE HYDRANTS • SQUARE BOTTOM VALVES
CHECK VALVES • TAPPING SLEEVES • AIR RELEASE VALVES



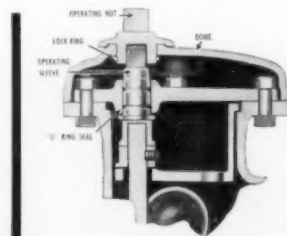
This is the hydrant that has been the standard of excellence in hundreds of cities for many years. Inspectors, maintenance men and fire chiefs, all have their reasons for endorsing the Rensselaer Corey Hydrant.

The illustrations show the clear-flow design which insures low head loss and maximum flow. Maintenance men like the simplicity of design and the speed of removing, inspecting and replacing the working parts as a single unit.

This hydrant opens with the pressure, is easy to operate and cannot stick. No digging for repairs, or for standpipe breakage. Now available with any type connection and "O" Ring seal.



**CLEAR FLOW
LOW HEAD LOSS**



**HYDRANT HEAD
WITH "O" RING SEAL**

*Ask for
Bulletin "G"*



Rensselaer

VALVE CO.

DIVISION OF
THE LUDLOW VALVE
MANUFACTURING CO., INC.

GATE VALVES • FIRE HYDRANTS • SQUARE BOTTOM VALVES
CHECK VALVES • TAPPING SLEEVES • AIR RELEASE VALVES

TROY, NEW YORK

How to plan sewage, water and **FOR THE**

Specify LINK-BELT equipment . . . lasting, efficient, flexible

IN many cities, growing populations have required expandability to be designed into water and sewage treatment systems. Increasing production, plus anti-pollution measures, creates much the same situation in industrial waste treatment. The broad range of long-life Link-Belt sanitary engineering equipment is helping to meet these requirements—permitting design flexibility that provides for easy enlargement with minimum changeover.

Our sanitary specialists will work with your own engineers, chemists and consultants. For more details, call your nearest Link-Belt office.

OTHER LINK-BELT PRODUCTS INCLUDE:

Scum breakers, air diffuser units, non-clogging spray nozzles, traveling water intake screens, Roto-Louvre sludge dryers, chemical handling machinery, car spotters and haulage systems . . . Catalogs sent on request.



This Eastern sewage plant had to provide practical sewage treatment for a population of 870,000—yet be able to serve an esti-

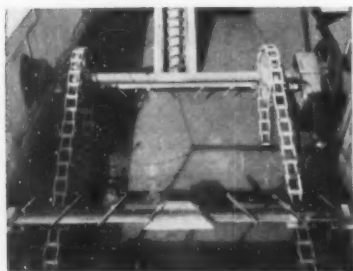
mated 1,200,000 expected by 1970. Link-Belt supplied screens, grit collectors and sludge collectors to handle 136 mgd.

LINK-BELT

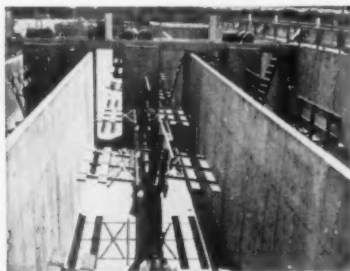
SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarborough (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

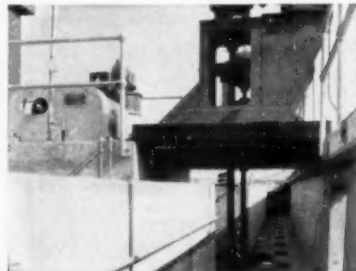
14,002



GRIT COLLECTORS AND WASHERS effectively collect and wash settled grit and separate it from putrescible organic matter before removing.



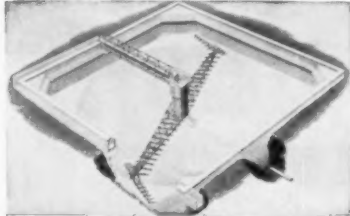
STRAIGHTLINE MIXERS for rectangular tanks, cross or transverse horizontal flow. Degree of mixing can be varied to produce maximum size floc.



FLASH MIXERS thoroughly mix chemicals prior to flocculation . . . prepare chemicals and water for immediate flocculation.



STRAIGHTLINE COLLECTORS for rectangular settling tanks feature peak-cap bearings, pivoted flights and Straightline action for top efficiency.

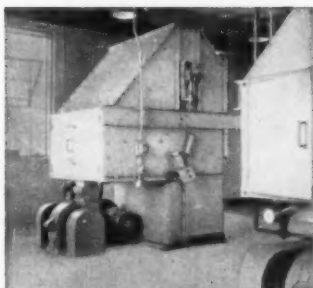


CIRCULINE COLLECTORS for square or round tanks provide positive sludge and scum removal in shortest time without septicity.

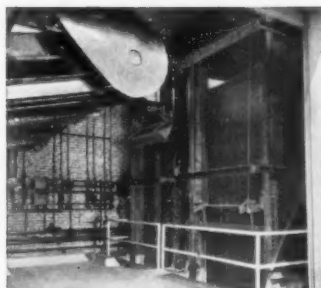


BIO-FILTRATION SYSTEMS utilize high-rate shallow filters . . . recirculation of effluent from filter to primary settling tanks . . . recirculation from final tank to filter. Single- or two-stage.

waste treatment facilities YEARS AHEAD



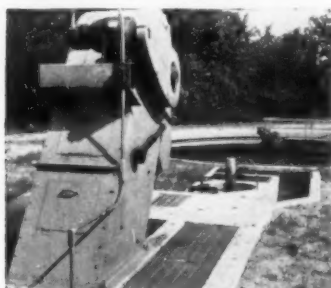
THRU-CLEAN BAR SCREENS remove large floating particles from large volumes of water, thus protect other equipment from damage.



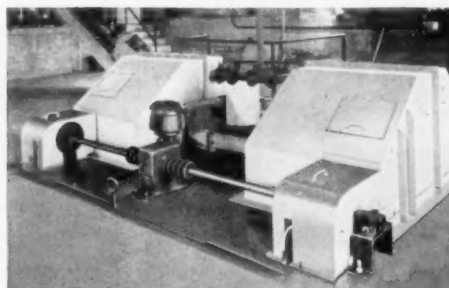
STRAIGHTLINE BAR SCREENS can't jam, assure constant, automatic screenings removal under extreme conditions.



TRASH SCREENS are operated intermittently for removing large floating debris to protect water screens and other equipment from damage.



TRITOR SCREENS remove both grit and screenings with one mechanism. Recommended for small sewage plants.



ROTARY DRUM SCREENS remove large quantities of fine solids from surface water intakes, settling tank effluents and industrial wastes. Extremely low maintenance requirements.



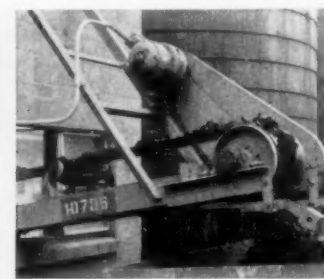
REVOLVING DISC SCREENS offer low-cost separation of very fine solids . . . minimum loss of head in installations where water depth is relatively constant.



LIQUID VIBRATING SCREENS are widely used for removing fine solids from liquids. Several sizes, with fine cloth.



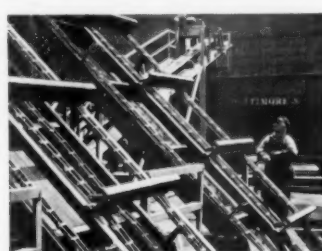
SCREW CONVEYORS AND BUCKET ELEVATORS meet the need for efficient handling of lime, alum and other chemicals where space is limited.



BELT CONVEYORS are one of various types of conveyors available for handling bulk or bagged chemicals, sludge filter cake or sludge from drying beds.



THICKENERS AND CLARIFIERS are made in several types and various sizes, including rake and flight types, for high efficiency and low cost operation.



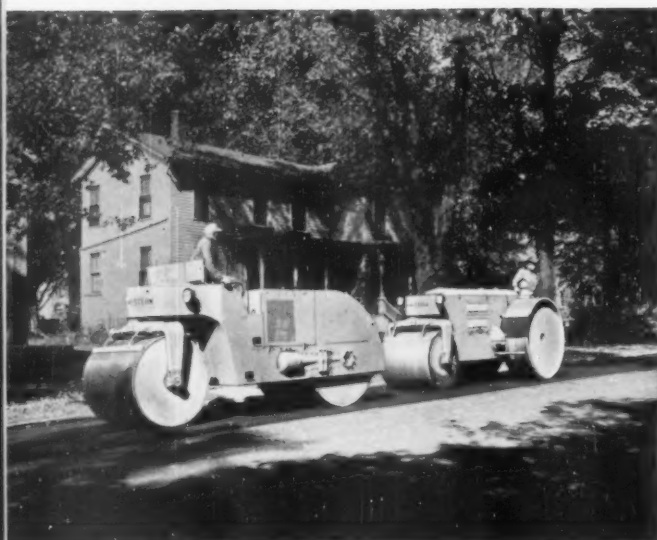
CHAINS AND SPROCKETS as on this mill scale collector or for any conveying or power transmission need can be found in Link-Belt's complete line.



POWER TRANSMISSION PRODUCTS include enclosed gear, fluid and variable speed drives; bearings; chain drives as used on this vertical Straight-line mixer.

AUSTIN-WESTERN ROAD ROLLERS

Engineered for Precision Operation and Trouble-free Performance



Engines, clutches, torque converters, brakes, hydraulic system units, bearings, seals and more than 75% of all other parts are interchangeable on Tandem and 3-Wheeled Rollers . . . an important service and repair advantage for the man who owns both types.



Tandem Rollers range in weight from 5 to 14 tons. Each is available with gasoline or diesel engine, and optional torque converter drive.

In this new series of Rollers . . . by America's first builder of motor rollers . . . all that is latest and best in engineering techniques and skills is combined with highest standards of construction to produce a truly fine product. With gasoline or diesel engines . . . dry clutch or torque converter drives . . . two-speed or four-speed transmissions, and drum-type front and rear rolls for water or sand ballast, these Rollers perform in a manner that will satisfy the most critical owner or operator . . . engineer or inspector. Your nearby A-W distributor will be glad to tell you the whole story. Austin-Western Works, Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Aurora, Illinois.

**COMPLETELY
NEW**



3-Wheeled Rollers range in weight from 7 to 14 tons. Each may be had with gasoline or diesel engine, and optional torque converter drive.

Power Graders • Motor Sweepers • Road Rollers • Hydraulic Cranes

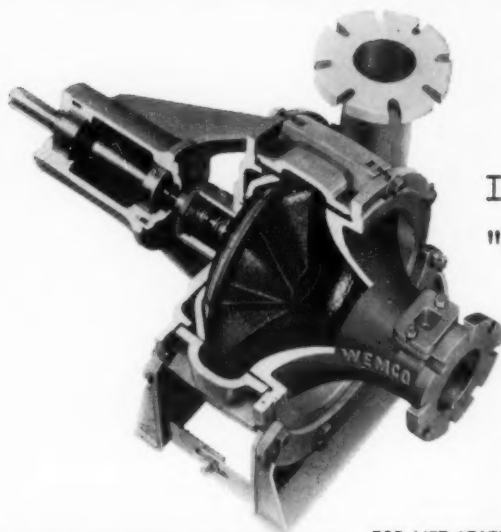


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WEMCO TORQUE FLOW SOLIDS PUMP



If you want a truly
"Never Clog Pump" specify as follows:

"Pump shall be of the non-clogging vortex type with recessed impeller mounted completely out of the flow path between pump inlet and discharge connections to enable passage of solids particles equivalent to discharge pipe diameter."*

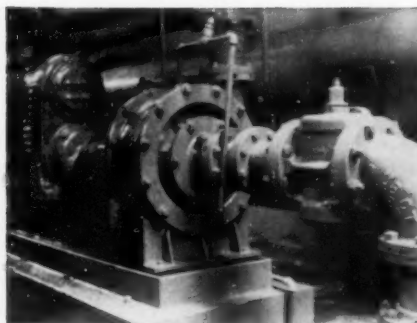
*Taken from consultants specifications for sewage and sludge pumps.



FOR LIFT STATION SERVICE:

Unattended, continuous operation is the standard operating procedure with Wemco Torque Flow Solids Pumps. Bar screens are eliminated. Frequent inspections are not required. Costly maintenance is eliminated. "Never clog operation" is inherent in the pump's design.

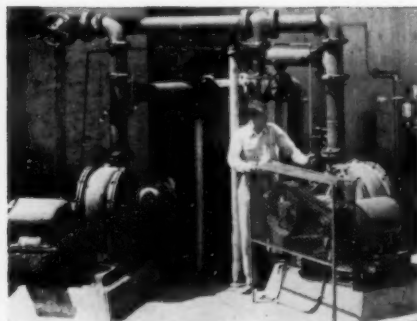
At Torrance, California



FOR SLUDGE PUMPING: TRANSFER OR RECIRCULATION, RAW OR DIGESTED

Sludges with high percentage of solids are handled without blockage. Suction lifts are extremely high at both high and low volume. Long wear life of parts and complete freedom from clogging on rags and fibers prevents down time losses and high maintenance.

At Rockaway, New York



FOR GRIT HANDLING OR DIGESTER CLEANOUT:

Wemco Solids Pump never clogs either in continuous or intermittent operation. Long wear life and no blockage combine to provide the ultimate in overall low cost material handling.

At Los Angeles County, California

General Specifications:

Sizes: 3" through 8"
Material: Cast Iron
Capacities: 50 GPM to 2500 GPM
Heads: Up to 100'
Necessary Clearance
Adjustment: None
Models: Horizontal or Vertical (Most sizes)
Drive: V-Belt, Varidrive or direct connected (Most models)

General Specifications:

Sizes: 2" through 8"
Material: Cast Iron or Ni-Hard
Capacities: 50 GPM to 2500 GPM
Heads: Up to 100'
Necessary Clearance
Adjustment: None
Models: Horizontal or Vertical (Most sizes)
Drive: V-Belt, Varidrive or direct connected (Most models)

General Specifications:

Sizes: 2" through 8"
Material: Ni-Hard
Capacities: 50 GPM to 2500 GPM
Heads: Up to 100'
Necessary Clearance
Adjustment: None
Model: Horizontal only
Drive: V-belt or Varidrive

On Sanitation Pumping Problems consult your local Wemco representative:

Atlanta 5, Georgia,
W. D. Taulman & Associates,
P. O. Box 436, Northside Branch
Baltimore 1, Maryland,
Stuart Corporation,
516 North Charles Street
Boston (Newton Lower Falls, Massachusetts),
Engineering Sales Corporation,
2300 Washington Street
Chicago 44, Illinois,
O. A. DeCelle and Associates,
4900 West Madison Street
Columbus 12, Ohio,
Robert F. McGivern and Associates,
1771 West Fifth Avenue
Dallas 25, Texas,
L. E. Livingston and Son,
3921 Purdue Street
Dearborn, Michigan,
Michigan Hydrant & Valve Mfg. Co.,
8747 Brandt Avenue
Fort Worth, Texas,
J. W. Droke & Associates,
Box 2525, Carter Field
Kansas City (Merriam, Kansas),
Smith and Lovell, Inc.,
42nd and Merriam Drive
New Orleans 12, Louisiana,
Menge Pump & Machinery Company,
549 Dryades Street
New York 7, New York,
Turbine Equipment Company,
63 Vesey Street
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Oliver F. Barklage,
423 South 38th Avenue
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102 East Ninth Street

WESTERN MACHINERY COMPANY

764 Folsom Street, San Francisco 7, California

Representatives in principal cities of the United States and Canada and in major countries throughout the world.



Wemco's Torque Flow design has been responsible for many outstanding "never clog" records. The principle is fully explained in available literature. It will save you thousands of dollars in operating costs. For further details contact our representative in your area or write direct.

Municipal Water Filter Installation cost can be cut 1/2 to 1/3 with...

SPARKLER *Diatomite* FILTERS

Engineers in charge of new Municipal Water Works filtration systems are more and more favoring the SPARKLER DIATOMITE FILTER MODEL SCJ because:—

1. The original cost of a diatomite plant for public supply is 1/2 to 1/3 the cost of a sand plant of equal capacity.
2. Diatomite filtration reduces the chlorine demand of the water by removing organic matter to an exceptionally high degree. The overall bacteria reduction in the effluent is from 80% to 90%. Sterilization of the finished water can be accomplished with much less chlorine. This results in reducing consumer complaint due to chlorinous tastes.
3. Turbidity less than 5 P.P.M. can easily be maintained at all times even though the raw supply fluctuates greatly. Channeling, mud balling and other common sand filter shortcomings are never a problem.
4. Operating cost compares favorably with conventional sand.

Interior construction of Model SCJ Water Filter. Sparkler filtration engineers have introduced, in the SCJ filter, new principles of diatomite filtering that are much superior to old methods and comprise the most advanced innovations in recent years.

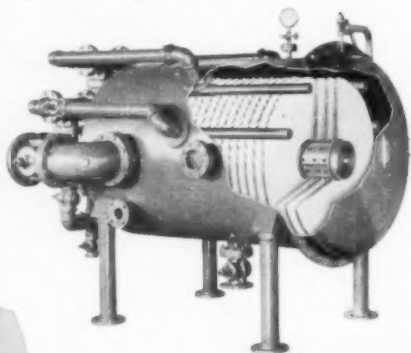
Less than 0.2% of water is required to sluice and clean the Model SCJ filter. The largest filter units can be cleaned and a new fresh diatomite pre-coat applied and the filter back in operation in 20 minutes or less.

Operators can be easily trained to handle this filter, no highly skilled specialized personnel is required to insure efficient performance.

Sparkler Model SCJ filters can supply practically any required volume of city water. Single units with a capacity of 5,000,000 gal. per day are available. Multiple units including a standby filter is usually employed to insure uninterrupted service for large volume requirements.

Modern electronic control instruments are readily adaptable to these filters, making uniform high quality water supply sure and automatic.

The startlingly low original cost, simple operation, and positive, consistent high quality filtration makes the Sparkler Municipal Water Works filtration system worthy of the most thorough consideration by water works engineers.



SPARKLER FILTERS

SPARKLER MFG. CO., MUNDELEIN, ILL.

Sparkler International Ltd. with plants in Canada, Holland, Italy and Australia — Service representatives in principal cities throughout the world.



LEADER IN
PUBLIC WORKS



Ladis H. Csanyi, Professor of Civil Engineering at Iowa State College, is a graduate of Brooklyn Polytechnic Institute and holds the degrees of CE and MCE. From 1929 to 1946 he was an engineer in the Department of Borough Works of Manhattan, New York City, where he gained a broad experience in field surveys; as supervisor of construction for a portion of the East River Drive; as Engineer of Research for four years; as superintendent of the old Asphalt Plant and designer of the new plant; as Assistant Maintenance Engineer of highways, streets and sewers; and as coordinator of projects relating to traffic and highways with other interested departments in the City. From 1942 to 1947 he also acted as consultant on design of paving plants and pavements all over the world. In 1947 he joined Edwards, Kelcey and Beck, consulting engineers, and was engaged on traffic surveys for New Jersey turnpikes and expressways and on their design.

Since 1949 he has been Professor of Civil Engineering and Professor in Charge, Bituminous Research Laboratory, Iowa State College, and has taught highway construction and traffic engineering subjects. He was born in Budapest, Hungary, and is a naturalized American citizen. He holds Professional Engineer licenses from New York, New Jersey, Connecticut, Florida and Iowa; and is a member of many engineering societies, including the ASCE, the ASEE, the ARBA, the Highway Research Board, the Institute of Traffic Engineers and the American Association of Asphalt Paving Technologists.

Polselli & Angelucci use Heltzel Flexible Radius Forms in pouring a sharp curve in the driveway section of Abington School in a Philadelphia suburb.

For more gentle radius curbs, Heltzel Straight Curb Forms were used. Abington School required approximately two miles of curbing.



"For my money, I'll take Heltzel Forms ...everytime!"

SAYS LEADING PHILADELPHIA CONTRACTOR

"I've used them all, and I'll say Heltzel builds the best line of forms I know of," says George Angelucci, partner of Polselli & Angelucci, one of Philadelphia's best known curbing contractors.

"My form setting crew can set a third again as many Heltzel Forms as other makes," continues Mr. Angelucci. "What's more, Heltzel engineers know the industry, and design their forms to the contractor's advantage. There's no form bowing because the stake pockets are placed in just the right spots to give the form maximum strength and rigidity."

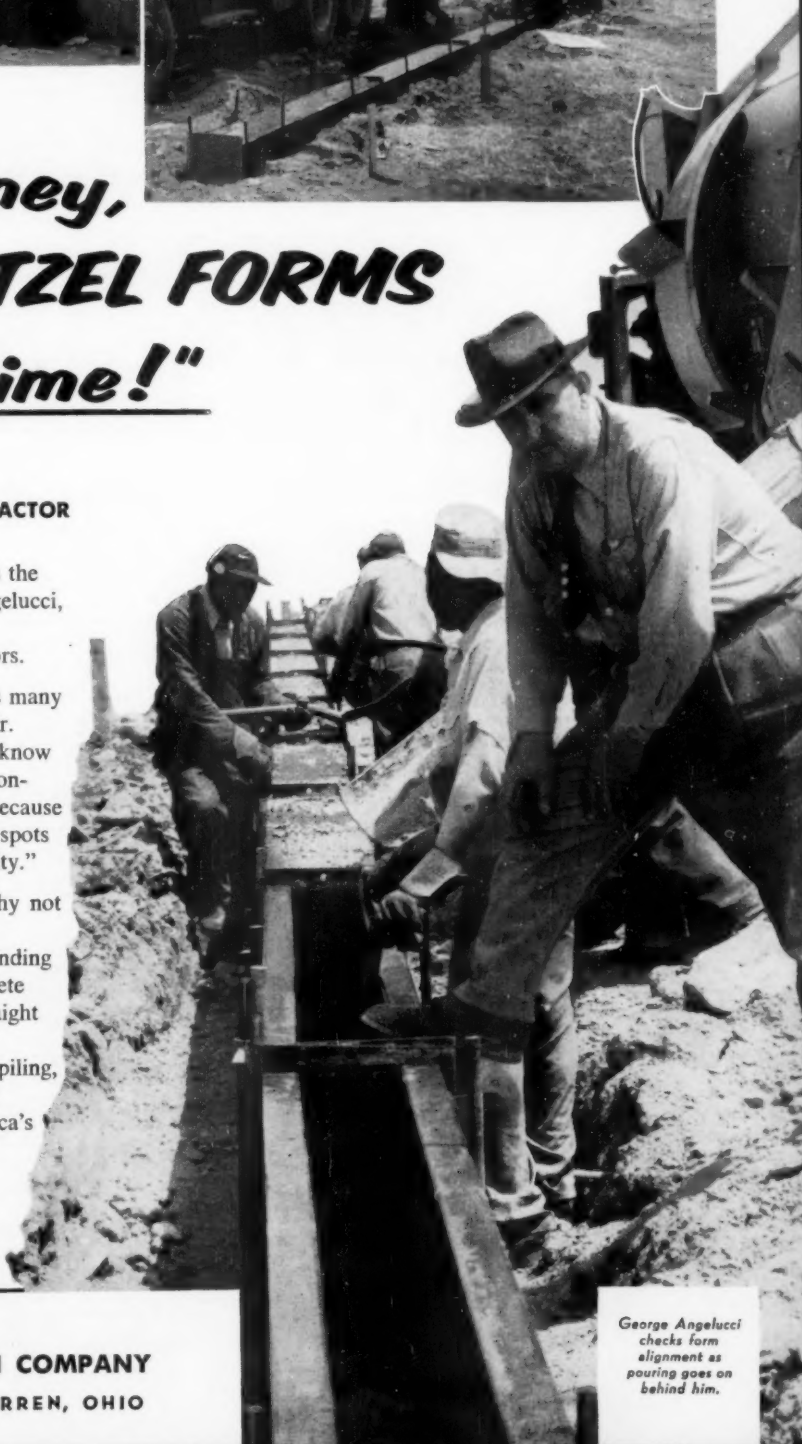
If you haven't as yet tried Heltzel Forms, why not take the advice of leading contractors—like Polselli & Angelucci—and use the one outstanding form available today. Heltzel builds a complete line of steel forms for any concrete job — straight curb, radius curb, curb and gutter of any description, sidewalk, driveways, foundations, piling, island, etc. Next time — specify "Forms by Heltzel" — for almost half a century America's leading form manufacturer.



THE Heltzel STEEL FORM AND IRON COMPANY

89801 THOMAS ROAD

WARREN, OHIO



George Angelucci checks form alignment as pouring goes on behind him.

TFFI

UNDERDRAINS

are used in

Trickling Filters

at

CLYDE, OHIO

You can be sure it's the best if you use a filter with TFFI underdrain blocks specified

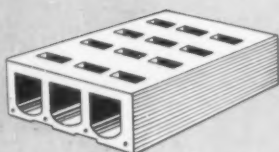
The essentials are the same for all trickling filters; for low rate or high. For large volume or small. The basic, properly designed trickling filter is capable of meeting all requirements—present and future—within foreseeable limits.



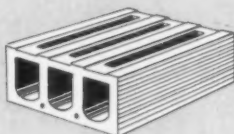
TRICKLING FILTERS COMBINE THESE 6 BIG ADVANTAGES

1. **LOW COST**, initially and in operation.
2. **SIMPLE, EASY OPERATION** with minimum man-power.
3. **LONG LIFE**. Outlast the bonds that pay for them.
4. **GOOD RESULTS**—top notch effluent at all times.
5. **RELIABLE** performance.
6. **OVERLOADS** are no problem. Take temporary shock loads or those of a new industry in their stride.

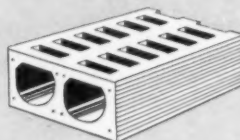
TRICKLING FILTER



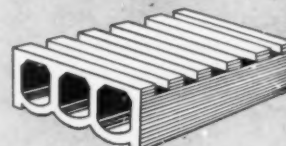
DICKEY
W. S. Dickey Clay Mfg. Co.
902 Walnut St.
Kansas City 6, Mo.



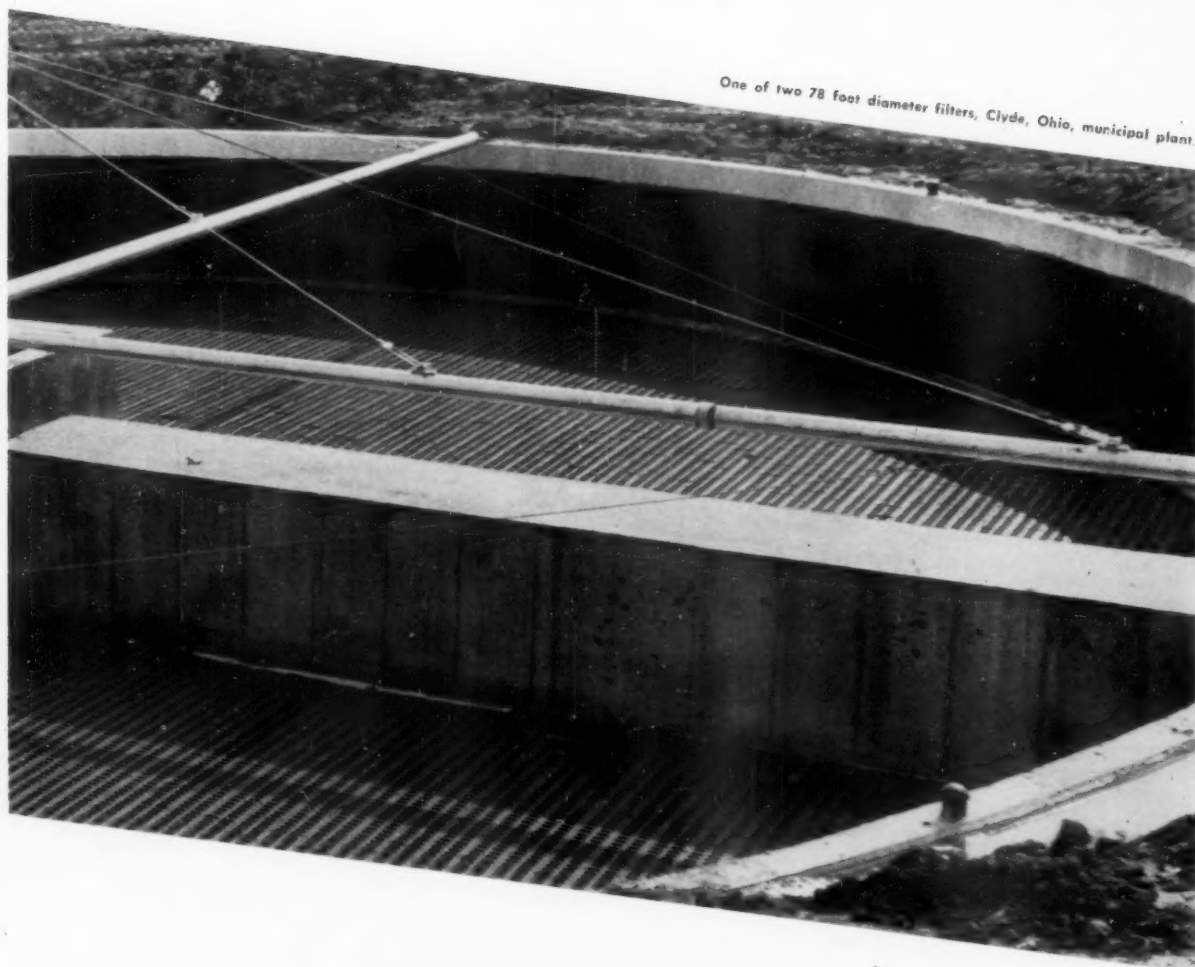
POMONA
Pomona Terra-Cotta Co.
Pomona, N. Car.



ARMCRE
Ayer-McCord Clay Co., Inc.
Brazil, Ind.



TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas.



One of two 78 foot diameter filters, Clyde, Ohio, municipal plant.

SPECIFICATIONS

Standard Specifications for Vitri-fied Clay Filter Blocks for Trickling Filters are given in full on pages 37 and 38 of 1954 revised edition of the **HANDBOOK OF TRICKLING FILTER DESIGN**. These specifications cover types of blocks, compressive strength, absorp-

tion, shape, permissible variations, apertures, shell and web thickness, drainage channels, workmanship, markings, testing—everything that an engineer needs to write specifications for trickling filter blocks. Secure your copy from any TFFI member listed below.

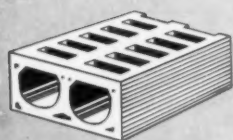
CLYDE FILTERS DATA

Designed by Finkbeiner, Pettis and Strout, Consulting Engineers, Toledo 4, Ohio.

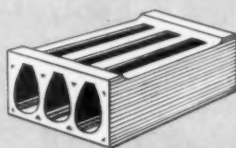
Constructed by Focht Brothers, Inc., Tiffin, Ohio.

Major Equipment: Distributors, Siphons, Sludge Digesters; Pacific Flush Tank Co. Sludge Collectors, Jeffrey Manufacturing Co. Sludge Pumps, Marlow Pumps, Pumps, Comminutors; Chicago Pump Co. Flow Metering, Simplex Valve and Meter Co.

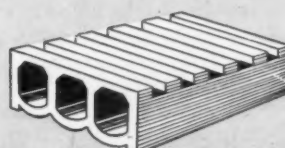
FLOOR INSTITUTE



BOSCO
Bowerston Shale Co.
Bowerston, Ohio



NATCO
Natco Corporation
327 Fifth Ave.
Pittsburgh 22, Pa.



TRANSLOT
Cannelton Sewer Pipe Co.
Cannelton, Ind.



Symbol of
good treatment



MONOTUBE POLES... "AT HOME" IN ANY LOCATION.

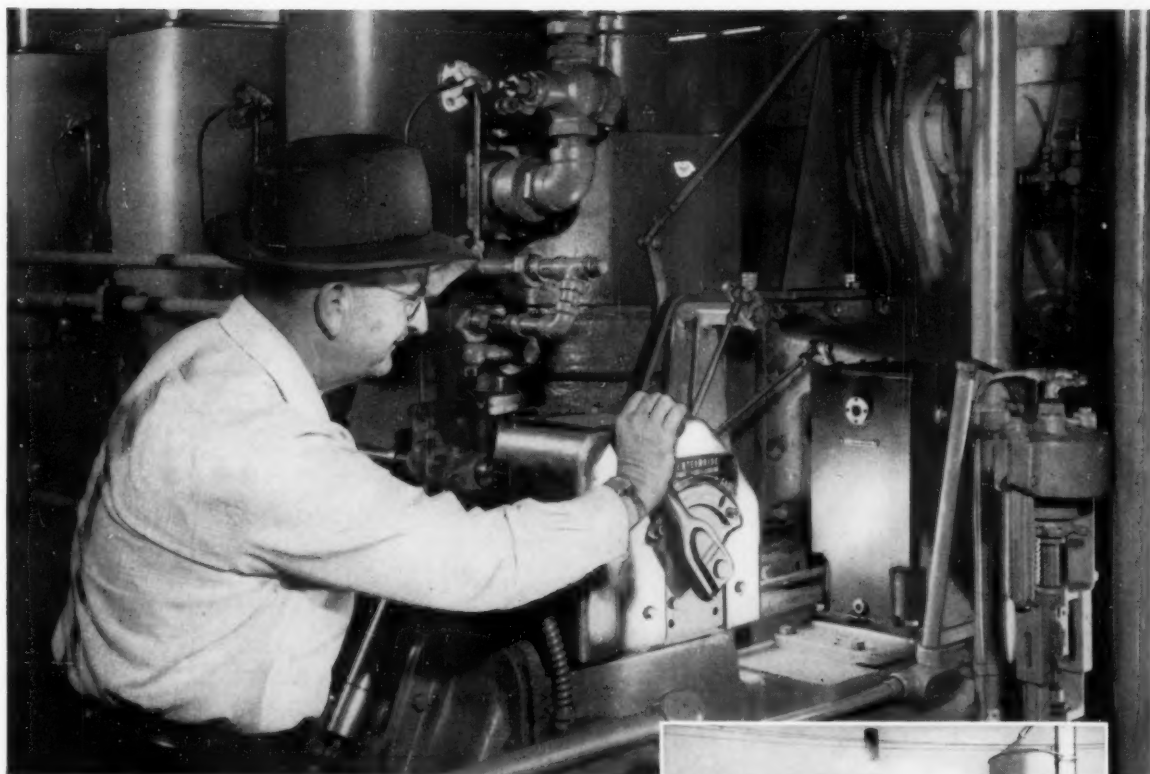
For improved nighttime lighting and improved daytime appearance, Monotube poles and modern luminaires combine to offer the *perfect* answer to any street, highway, bridge or expressway lighting problem. This twin-bracket highway installation is a typical example. It will pay you to take advantage of Monotube versatility and Union Metal's nearly 50 years of pole engineering and manufacturing experience . . . to meet *every* outdoor lighting need.

Write to The Union Metal Manufacturing Company, Canton 5, Ohio, for complete catalog or helpful advisory service.

1906 *Fiftieth Anniversary* 1956

UNION METAL

Monotube Lighting Poles



Walter T. Messeck, Supt. of Utilities at Tipp City, Ohio, sets Enterprise "Select-O-Matic" control for Dual Fuel operation.

Dual Fuel? Heavy Fuel? Tipp City, Ohio, Profits From Both With Their Two Modern Enterprise Engines

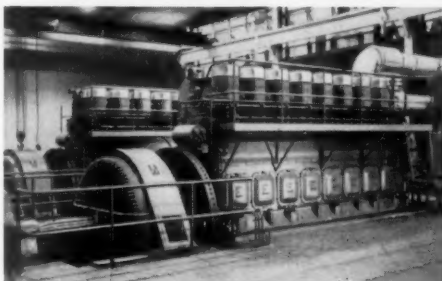
As long as fuel prices fluctuate, and availability of different fuels varies, Enterprise "Select-O-Matic"® Dual Fuel engine systems contribute important savings in power production.

This is the case at Tipp City, Ohio, where they converted their Enterprise Engines from straight diesel operation just two years ago. Dual fuel operation on natural gas and No. 2 diesel pilot fuel is alternated on a seasonal basis, with straight diesel operation using either light or heavy fuel oils, depending on the current market price of the various grades of oil, during the winter months when gas is not available. Gas and heavy fuel operation is economical, and in this business the saving of as little as 1 mill per kilowatt hour amounts to a pretty penny when you're generating 9,488,200 KW hours a year as was the case at Tipp City in 1955.

Let us show you how Enterprise Dual Fuel economy can improve your operations. Write today for full information, or call your nearest Enterprise sales and service office.



The Tipp City Diesel Power Plant is a modern show place. Hundreds of visitors have inspected this efficient, well-run operation where two 1755 HP Enterprise Turbo-charged Engines supply all the power. Dual fuel and heavy fuel systems were installed in 1954, to take full advantage of the less expensive fuels available.



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New Orleans • New York • Philadelphia • Pittsburgh • San Diego • Seattle • St. Louis • Tulsa • Washington, D. C.

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EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

Paving Manual on Asphalt Hot-Mix Design

Authoritative instructions on mix design methods for hot-mix asphalt paving are furnished in a new 168-page pocket-size manual published by The Asphalt Institute. The Marshall, Hveem, Hubbard-Field and Smith Triaxial methods are outlined in detail; test procedure and interpretation of data are provided for each method; and information is given on gradation analysis of aggregates and on density and voids analysis of compacted paving mixtures. The price of this Manual is \$1.00. To order, write direct to The Asphalt Institute, College Park, Md.

"Custom-Engineered" Bar Screening in Waste Treatment

38. Low cost bar screening installations and operation are pointed out in a bulletin just released by Chain Belt Co., Dept. PR, Milwaukee 1, Wisc. Details of a "Front-Cleaning" design, photos of actual installations, and mechanical features are included. Check the reply card for your copy.

Data on Back Cleaned Bar Screen

40. A completely new two color bulletin describing the back cleaned bar screen for sewage plants and industrial waste treatment installations has been released by Walker Process Equipment Inc., Aurora, Ill. Application of screens, design data, drawings and pictures are included. Check the reply card.

For Prompt Service Use The Reply Card

Submersible Pumps For Municipal Use

185. A new 12-page bulletin that describes the line of BJ submersible pumps is available from Byron Jackson, Division of Borg-Warner Corp., P. O. Box 2017, Terminal Annex, Los Angeles 34, Calif. Construction and operation of the pumps are covered along with a handy selection chart that gives capacity and head performance. Check the reply card today.

Literature on Galion Roll-O-Matic 3-Wheel Roller

187. A highly illustrated catalog is now available on the new Galion "Chief" 3-wheel roller. All important features of design and construction are presented in detail. Detailed weight distribution and compression data on the various sizes of rollers are listed along with a complete line of attachments. Check the reply card or write Galion Iron Works & Mfg. Co., Galion, Ohio.

What You Should Know About Chemical Weed Control

203. General information on how and when to use Telvar, the chemical weed killer, is described in literature available from E. I. DuPont de Nemours & Co., Inc., Wilmington 98, Del. Application rate, type of weeds killed, type of equipment used for application are some of the sections covered. Check the reply card.

Remote Electrical Transmission System for Water and Sewage Field

215. A well-documented 16-page bulletin that describes the versatility of the system for transmission of flow data, liquid level data, or pressure measurement data has just been released by Simplex Valve & Meter Co., Lancaster, Pa. It contains diagrams of each type of application in addition to dimensional drawings and capacity charts. Check the reply card.

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

Swimming Pool Data Book

372. A 52-page book, profusely illustrated, containing data, photographs and prices of every item needed to build a new residential or public pool, or to equip and maintain an existing pool is now available. There is a section on proper pool care and maintenance and detailed descriptions of approved water treatment chemicals. Book is available by checking the reply card or writing to Modern Swimming Pool Co., Inc., 1 Holland Ave., White Plains, New York.

Data On Utility Spray Tanks



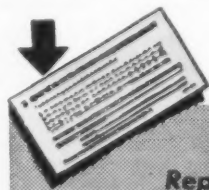
221. A new 8-page catalog describes and illustrates truck mounted, 2-wheel trailer, and 4-wheel trailer utility spray tanks. These tanks combine three operations in one unit, bar spraying, hand spraying and a pouring pot outlet for patching and crack filling. Two types of spray bars are available; the 10-ft. tubular type or the 8-ft. mechanically operated full circulating. For more information request Bulletin #GG-5, Littleford Bros., Inc., Box 73, 452 E. Pearl St., Cincinnati 2, Ohio, or check the reply card.

Information on Pressure Sand and Gravel Filters

406. A 12-page fully illustrated bulletin that completely describes the uses, design features and engineering details of pressure sand and gravel filters is available from Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y. Details of all accessory equipment, the different types of controls available and a detailed table giving capacities, sizes and space requirements are included. Check the reply card.

Kaiser Aluminum Signs and Markers

457. A 12-page booklet containing information on highway signs and markers has just been published by Kaiser Aluminum & Chemical Sales, Inc., Consumer Service Division, PR-856. The booklet lists sizes and availabilities of various types of sign blanks and also included is detailed information on methods of finishing aluminum sign panels by applying reflective sheeting, paint, baked and porcelain enamel. Check the handy reply card.



Use the
Reply Cards
Inside Front Cover

Residential Street Lighting

228. A new 16-page bulletin on residential street lighting is now available from the General Electric Co., Schenectady 5, N. Y. Well illustrated, the bulletin, designated GEA-6316, explains how good lighting benefits a residential community and provides information on how to plan modern residential lighting installations. Check the reply card for your copy.

Booklet On Electric Sets For Power and Protection

223. "Cat Electric Sets For Power and Protection" is the title of a new 16-page booklet just released by Caterpillar Tractor Co., Peoria 8, Illinois. It is well illustrated with pictures of actual installations and the many different kinds of uses of these power plants and some of the reasons why they are especially suited to the applications. Check the reply card today.

Information on Prestressed Concrete Tanks

269. New 4-page technical Bulletin T-42 describes current trends in the design and construction of prestressed concrete tanks, including illustrations of typical tanks and standpipes. Check the reply card or write The Precast Co., Inc., 211 East 37th St., New York 16, N. Y.

Literature on the Control of Filter Flies

302. Stop your filter fly problem with Paveon, a safe liquid chemical which will assure almost 100 percent kill of the larvae and pupae, as well as the adult filter fly. Details and technical bulletin on this chemical are available from National Disinfectant Co., 2417 Commerce St., Dallas, Texas, or by checking the reply card.

Concrete Shore Protection

317. Engineers and officials concerned with beach erosion control will be interested in a new illustrated 30-page booklet on the use of concrete shore-protection structure. Published by the Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill., the booklet presents a discussion of wave action as well as other factors influencing the type and design. Check the reply card today.

Tests Invited on This Durable Crosswalk Marking

64. Crosswalk markings of Veon, the instant setting line that is easily applied, trouble-free and economical is described in literature of the Veon Chemical Corp., 22-09 Bridge Plaza, North, Long Island City 1, N. Y. Available in white, red or yellow. Tests under your local conditions are invited. Get details by checking the reply card.

Literature on a Tailgate Loader

64. Information is now available on a safe, easy to operate tailgate loader. The loader is easy to install, light in weight and will lift a platform load of 600 lbs. It will fit most any standard pick-up or service utility body truck. Check the reply card or write to Midwest Body and Mfg. Div., Electrographic Corp., Paris, Illinois for your literature.



YOU BUY
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SERVICE

When you buy
Progressive AMERICAN METERS

Simplest design, fewest moving parts and rugged construction give American Meters a longer, trouble-free service period . . . In more than a million homes American Meters are demonstrating their reliable performance day after day, year after year, silently, dependably . . . And these same engineering achievements make American Meters easy and inexpensive to keep in service . . . 30 years and longer. If you are tired of spending money for continuous repairs . . . If you want a meter that will give you years of service-free operation . . . Buy American.

BUFFALO METER CO.

2920 Main Street, Buffalo 14, New York

To order these helpful booklets check the reply card inside front cover.

Overlaid Fir Plywood For Street and Highway Signs

304. Literature is now available on Harbrite, an overlaid fir plywood, for street and highway signs. One booklet covers the results of tests conducted on the use of overlaid plywood for signs and another bulletin includes a sample of Harbrite and additional information on its use in municipal, county and state traffic departments. Check the reply card or write Harbor Plywood Corp., Aberdeen, Washington.

New Detachable Container System of Rubbish Collection

391. The unique, hydraulic "two systems in one", TrashTainer system of rubbish collection with the Quad-O-Matic compaction truck body is fully described in literature available from TrashTainer Sales, Inc., 1341 Half St., S.E., Washington 3, D.C. Check the reply card to find out how this system saves on equipment, maintenance and manpower.

Catalog on Equipment For Ice and Snow Control

410. Information on Baker snowplows and Flink ice control spreaders is available from The Flink Co., Dept. 5613, Streator, Illinois. Fully covered are reversible and one-way plows with hydraulic power lifts to meet every specification and single or dual spinner type spreaders. For reference catalog #110 check the reply card.

WATER WORKS

Meters and Instruments For Water Works

43. An attractively arranged 20-page booklet issued by Sparling Meter Co., Box 3277, Los Angeles 54, Calif., furnishes concise data on the full line of Sparling meters, indicator-totalizer-recorder instruments and other special instruments and controls. Check the reply card for your copy, or write for Bulletin 314.

Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes. Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the reply card.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 55 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Get your copy by checking the reply card.

Handbook of Cast Iron Pipes and Fittings

52. Full engineering data on products of the Alabama Pipe Co., including Super De-Lavaud cast iron pressure pipe and pipe fittings, valve boxes and other municipal castings are provided in Pressure Pipe Catalog No. 54, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use reference. Requests for this valuable publication should be accompanied by your business letterhead.

Engineering Information and Water Distribution Products

49. Helpful engineering information, covering water distribution problems, is available from Mueller Company in their V-96 Water Works Catalog. The 328 page catalog features a quick reference sectional indexing arrangement for easy location and identification of the hundreds of water distribution and service products illustrated. Check the reply card and you will receive detailed information on a complete line of water works equipment.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

100 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH control and description of comparators, colorimeters and similar devices. A 100-page booklet is available by checking reply card W. A. Taylor Co., 7304 York Road, Baltimore 4, Md.

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co. Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews fire hydrant and R. D. Wood gate valves. Check the reply card for this useful information.

Motor Units for Valves, Floorstands and Sluice Gates

82. Complete information on Chapman motor units is available in catalog No. 51 from The Chapman Valve Manufacturing Co., Indian Orchard, Mass. Advantages, installation and operation are fully described. For more details on these units check the reply card today.

What You Should Know

About Turbine Pumps

167. In a colorful bulletin titled "Water Where You Want It... When You Want It" the Johnston Pump Co., Bin "K", Pasadena 8, Calif., gives details on turbine pumps with semi-open or closed impellers; oil or water lubrication; and adaptations for any power source or combination thereof. Get your copy of Bulletin 1015 by checking the reply card.

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Parlon® Stays On

Protects Municipal Swimming Pools



PARLON ON CONCRETE—Since the City of Omaha opened this municipal pool in 1950 it has been kept looking its Sunday Best all season long by RAMUC, a Parlon-based protective coating manufactured by Inertol Co., Inc., Newark, N. J. Omaha's general foreman of maintenance credits this finish with keeping this concrete pool attractive while holding down maintenance and operating costs.

Whether the pool is steel or concrete, municipal maintenance departments heads throughout the nation have found that they can depend on a Parlon-based finish for longer-lasting beauty at lower long-term cost.

Already familiar with the unique chemical and corrosive resistance qualities of Parlon-based coatings for many other municipal uses, these men have found that special Parlon formulations provide the colorful finish they want for pools combined with under-water wearing properties that mean less maintenance cost.

Wherever protective coatings must meet a challenge, whether it be interior or exterior, masonry, wood or metal, look to Parlon for the ideal all-purpose maintenance paint. Your local paint supplier can provide additional information, or write direct to Hercules.



PARLON ON STEEL—This steel pool, too, is painted with RAMUC. Its tile-like finish has withstood the attack of water and water-treatment chemicals without peeling or powdering.

Cellulose Products Department
HERCULES POWDER COMPANY
INCORPORATED
978 King Street, Wilmington 99, Del.



PARLON CHLORINATED RUBBER PAINTS ARE AVAILABLE FROM 400 MANUFACTURERS UNDER THEIR OWN BRAND NAMES

To order these helpful booklets check the reply card inside front cover.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Engineering Data on Diatomite Filters

129. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the reply card for full information including table of filter sizes and capacities, space required and filter operation.

Helpful Reference Catalog on Waterworks Gate Valves

146. All necessary details on Double Disc Parallel Seat Gate Valves for waterworks use are provided in the attractive 36-page bulletin issued by Ludlow Valve Mfg. Co., Inc., Troy, N. Y. Conveniently arranged design data shows all dimensions for 2" to 60" valves. Gearing, floor stands, operating devices are covered too. Get Bulletin 54W by checking the reply card.

Better Highways Through Salt-Soil Stabilization

162. Practical information for the men who build, repair and maintain our highways is provided in two bulletins issued by the International Salt Co., Inc., Scranton, Pa. General principles of salt-soil stabilization, applications, plant mix and road mix are described. Check the reply card for your copies.

A Streamlined Housing for Filter Control System

200. The Pneumaster Console provides a factory assembled unit that provides accuracy and sensitivity obtained by use of precision indicating gauges, easy installation, minimum maintenance and other advantages. For further information write to Builders-Providence, Inc., 345 Harris Ave., Providence, R. I., or check the reply card.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 5415, Shepard Station, Columbus 19, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the reply card to get your copy.

Data on Instrumentation For Water Treatment Plants

120. Instrument control for water treatment plants is illustrated and described in Bulletin 90-241-10, issued by Fischer & Porter Co., Hathboro 35, Penna. Illustrations include a flow diagram showing the F & P system for operation of rapid filters by means of modern instrumentation. Operation of the filter table is described in detail. Other instruments described include standard, portable and automatic proportioning chlorinators, flow meters and residual chlorine analyzers. Check the coupon for your copy.

What You Should Know About Steel Reservoirs and Standpipes

163. In a handsome 24-page booklet "Horton Steel Reservoirs and Standpipes," the Chicago Bridge & Iron Co., Chicago 4, Ill., shows installations from 50,000-gal. to 10,000,000-gal. capacity with several types of roof and special architectural features. Engineering data includes information on capacities, foundations and improved surface protection. Check the reply card to get your copy.

Locate Mains, Services and Leaks Without Digging

186. An 8-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes, cables, valves, manhole covers, conductive and non-conductive sewer pipes and septic tanks by electronic means. Dry battery operated. Only one man is needed for operation. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif., by checking the reply card.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the reply card.

Valuable Information on Water And Waste Treatment Instrumentation

229. Helpful data on pneumatic instrumentation, flow measurement, recording controllers and rapid sand filter control systems are included in a 16-page Bulletin 1-15. Get this from the Foxboro Co., Foxboro, Mass., or by checking the handy reply card.

Pressure Pipe Installation Guide

237. A new 108-page instruction manual just issued by Johns-Manville, 22 East 40th St., New York 16, N. Y., is planned for on-the-job use at the trench site. The instructions take up every step from receiving the pipe at the job to testing the finished installations. Check the reply card today.

Auxiliary Electric Power For Public Utilities

249. Full descriptive information on Onan electric plants for every public utility need will be found in literature issued by D. W. Onan & Sons, Inc., Minneapolis 14, Minn. Be sure you have latest data on standby plants and controls for emergency electric power. Check the reply card now.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in convenient booklets offered with the commitments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the reply card.



Does bituminous paving or patch-work

Kwik-Mix bituminous mixers combine rubber-tired portability with big production capacity for paving roads, walks, parking areas, tennis courts, play grounds — and repairing busy streets, rail crossings. On patch-work, convenient end discharge permits direct pouring into pavement-break. On continuous paving operation, mixer can be towed by truck

(from which materials are supplied) and discharge the mix in windrows for spreading and rolling. 10 cu. ft. mixer can produce up to 22 tons per hour (based on 1½-min. mixing cycle, and aggregates weighing 110 lbs. per cu. ft.). On same basis, 14 cu. ft. mixer averages 30 tons hourly. See Kwik-Mix distributor or send for bituminous mixer catalog.

mail to:

KWIK-MIX COMPANY, Port Washington, Wis. (Koehring Subsidiary)
Send us literature on: ☐ 10 ☐ 14 cu. ft. bituminous mixers.

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KMG73 PW



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Produced from an inland pit hence free from river contamination and foreign matter.

Shipment in bulk or bagged.

Many of the larger filter plants throughout the United States are equipped with our products.

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Pipe section under test is 132" in diameter, six feet long, with a 12" wall thickness.

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pre-testing...*

**Large diameter pipe and
high strength can go
together!**

Stop the guesswork... install American-Marietta Company concrete pipe of pre-tested strength. To prove the strength of large diameter A-M pipe, we will gladly test pilot sections under your supervision on our special machines.

Another plus—precasting under factory control means an accurate proportioning of quality materials—with a strict adherence to design specifications—remote from the hazards of trench construction.

American-Marietta Engineers will aid in the design of precast concrete pipe sections to meet special requirements in sizes from four inches through 144 inches in diameter—then pre-test the section to guarantee the strength of the design.

*Our technical staff will be pleased to assist you
with any of your pipe problems*



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Lamar Pipe and Tile Company

Lewistown Pipe Company
Universal Concrete Pipe Co.
American-Marietta Company of Pennsylvania

To order these helpful booklets check the reply card inside front cover.

What You Should Know About Fluoridation

317. A helpful publication entitled "Fluoridation" which describes the development of fluoridation and lists the chemicals and dosages normally used has been prepared by Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J. Copies of publications on both solution and dry feed W&T Fluoridators are also available. These publications are yours for checking the reply card.

Quick Review of Water Meters

316. A helpful condensed catalog which covers sizes and types of water meters for every kind of service is available from Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. Each type is illustrated and fully described; specifications and prices are included. Gen. Bulletin W-800 by checking the reply card.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa. Get full details by checking the reply card.

Engineering Data on Lubricated Plug Valves

355. Full information on Homestead lubricated plug valves in full-port and venturi types, sizes up to 14", and with a choice of self-sealed two-piece plug or one-piece plug designs. Engineering information includes principal dimensions, types of control, metals, lubricants, etc. For your copy write Homestead Valve Mfg. Co., Coraopolis, Pa., or check the reply card.

All About

Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use reply card or write to Fairbanks, Morse & Co., Dept. P. W., Chicago 5, Ill.

Modern Filtration of Swimming Pool Water

351. Latest data on filtration systems for swimming pools of 50,000 gallon capacity and over is presented in 24-page bulletin No. 625 by R. P. Adams Co., Inc., 225 East Park Drive, Buffalo 17, N. Y. Design and operating data are provided, together with material to assist you in choosing the right filter for your pool. Check the reply card for your copy of this helpful bulletin.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Red Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Get latest data by checking the reply card.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass. Check the reply card.

Engineering Data on Asbestos Cement Pipe

372. Advantages of corrosion-free asbestos-cement pipe for water distribution plus full data on installation methods, cutting, making connections, testing, dimensions and weights are contained in the booklet, "Mains Without Maintenance," issued by Keasbey & Mattison Co., Ambler, Pa. Get your copies by checking the reply card.

How to Clean and Develop Water Wells

375. The use of Welstone, which combines the cleaning power of Calgon with disinfecting and other chemicals in a safe, highly soluble powder is described in an interesting and informative booklet. For your copy of this descriptive literature write Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa. or check the reply card.

Book Tells How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 300 Park Ave., New York 22, N. Y. Check the reply card.

What You Should Know About Meter Setting and Testing Equipment

413. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All water works men concerned with setting and testing meters will want a copy of this catalog, No. 56. Check the reply card for your copy.

Helpful Engineering Data on Cast Iron Pipe

422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long. Check the reply card.

Important Factors in Water Meter Selection

463. Interchangeability of parts is an important advantage that is yours when you use Trident meters. The newest parts fit your oldest Tridents so you modernize when you repair. Get full data on the entire Trident water meter line by checking the reply card or write to Neptune Meter Co., 19 West 50th St., New York 20, N. Y.

Catalogs on Horizontal and Industrial Service Pumps

477. Pump capacities, heads and horsepower are fully described in Catalogs B-505 and B-1300 available from Peerless Pump Div., Food Machinery and Chemical Corp., 301 West Avenue 26, Los Angeles 31, Calif. For this information on how these horizontal and industrial service pumps can help, you check the reply card.

CURB YOUR COSTS on Curb and Gutter Jobs with **BLAW-KNOX** Street Forms

YOU can cut forming costs in half and be set to take on a wide range of curb and gutter jobs with Blaw-Knox "Universal" steel street forms. One "Complete Package" of these forms handles every concrete curb, curb and gutter, integral curb or sidewalk job from simple straight work to curved and serpentine shapes. They are standardized and completely interchangeable so you can do the most work with the smallest investment in forms. They are fast and easy to set or strip, and practically eliminate hand finishing. The need for expensive carpentry and costly single-use materials is eliminated, too. Your Blaw-Knox distributor can give you complete details—see him today.

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Self-aligning road forms save time and materials on highway and airport paving, too. Road forms are available in heights of 8" or more and Airport forms in heights of 12" or more.

BLAW-KNOX COMPANY
CONSTRUCTION EQUIPMENT DIVISION
43 Charleston Avenue, Mattoon, Illinois



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Rubber

GASKETS

put new sanitary sewers ahead

3WAYS



Engineers and officials of the Madison Metropolitan Sewer District had their eyes on present, as well as on future efficiency of the city's new sewers and extensions of existing systems. In specifying TYLOX-Jointed concrete pipe, they put their projects ahead on three counts that mean a lot in protecting public funds invested in waste disposal projects . . .

NO JOINT LEAKS — TYLOX Gaskets seal by compression . . . water can't pass in or out of the pipe. With no leakage, there's no root problem, and no infiltration overload at the treatment plant.

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NO PIPE-LAYING DELAYS — TYLOX Gaskets reduce construction costs by speeding pipe work . . . *Flexibility* compensates for pipe angularities in any plane . . . permits wet-trench jointing . . . immediate backfilling.

Send for more details, and more case histories on TYLOX today. Write TYLOX RUBBER JOINTS into your specifications, and be sure of fast-working, leak-proof and non-deteriorating pipe lines.

5035

* **PROJECT:** Madison Metropolitan Sewerage District.

ENGINEERS: H. O. Lord, Chief Engineer and Director, W. J. Landwehr, Supervising Engineer, J. H. Maxfield, Resident Engineer, and W. W. Johnson, Civil Engineer.

CONTRACTOR: Central Contracting Company, Oskosh, Wisconsin.

PIPE: TYLOX-Jointed reinforced Concrete Pipe, manufactured by Madison Concrete Pipe & Products Co., Madison, Wisconsin.

**HAMILTON KENT
MANUFACTURING COMPANY**

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427 West Grant St.

Orchard 3-9555

To order these helpful booklets check the reply card inside front cover.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SewerodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the reply card for your copy of this helpful handbook.

Design Data on

Chemical Flocculating Equipment

89. Flash mixers, Straightline mixers, conveyors and elevators for handling chemicals are described in illustrated Bulletin No. 2442 available from Link-Belt Co., Colmar, Pa. Selection tables and diagrams are provided to help you select the equipment best suited to your needs. Check the reply card for your copy.

Proper Installation of

Bituminized Fibre Sewer Pipe

105. A well-planned instruction leaflet showing the proper step-by-step procedure for installation of Bernico bituminized fibre sewer pipe has been made available by Brown Co., 150 Causeway St., Boston 14, Mass. To make sure of best results in pipe installation, just check the reply card for your copy.

Do You Have An Independent Source of Electricity?

27. An independent source of electricity which will supply power for vital services when regular sources fail can be invaluable during emergencies. Check Kohler Bulletin KEP-31 which furnishes data that will help you select the plant best suited for your needs. Many models, 500 watt to 30 Kw, portable and stationary are described. Write the Kohler Co., Kohler, Wis., or use the reply card.

Helpful Installation Manual For Drainage Structures

62. A 46-page manual well worth careful study by designers and field engineers dealing with drainage structures, culverts, sewers or conduits, is offered by Armo Drainage & Metal Products, Inc., Middletown, Ohio. Proper location of the structures, base preparation, assembly and backfill are some of the many items covered in detail. Use the handy reply card for free copy.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers. Requests for this valuable booklet to made on business letterhead.

A Short Course

In Pipe Jointing

169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods; photos showing jobs where Tylox gaskets met the need for easily assembled, permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the reply card for free copy.

Non-Clogging Vertical Wet-Pit Pump Described

182. Full engineering data on Worthington "Freeflow" wet-pit pumps with non-clogging impellers capable of passing solids and stringy material are included in Bulletin W-317 B-12. Check these pumps for sump, sewage and drainage service. Bulletin available from Worthington Corp., Harrison, N. J. Just use the reply card.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the reply card or write F. B. Leopold Co., Inc., Dept. PW., 2413 W. Carlson St., Pittsburgh 4, Pa.

Expansion-Contraction Joints, Sealing Compounds and Waterstops

272. Helpful data to aid in the selection of premolded highway joint fillers and joint sealing compounds, rubber waterstops for concrete construction in water and sewage plants, sewer joint sealers and many related materials are provided in latest literature of Servicised Products Co., 6051 West 65th St., Chicago 38, Ill. Get full details by using the reply card.

Diesel Engines For

Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif. Get latest data by checking the reply card.

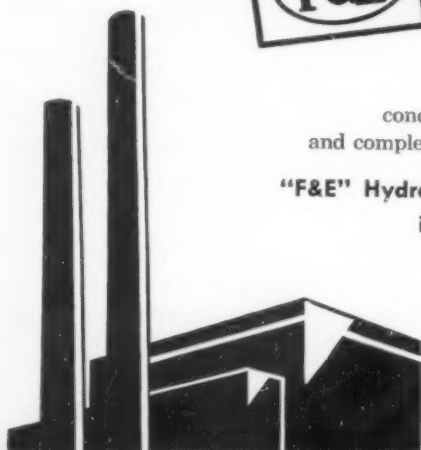
Modern Methods and Materials For Jointing Sewer Pipe

402. In a compilation of reprints and related supplementary material, the Atlas Mineral Products Co., Mertztown, Pa., presents a comprehensive review of all types of sewer jointing materials and methods. You will find this interesting and informative reading. Get a copy by checking the reply card.

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INCINERATOR STOKERS



Designed and manufactured by a century-old concern with 40 years' experience in designing, engineering and completely manufacturing hydraulically-powered stokers.

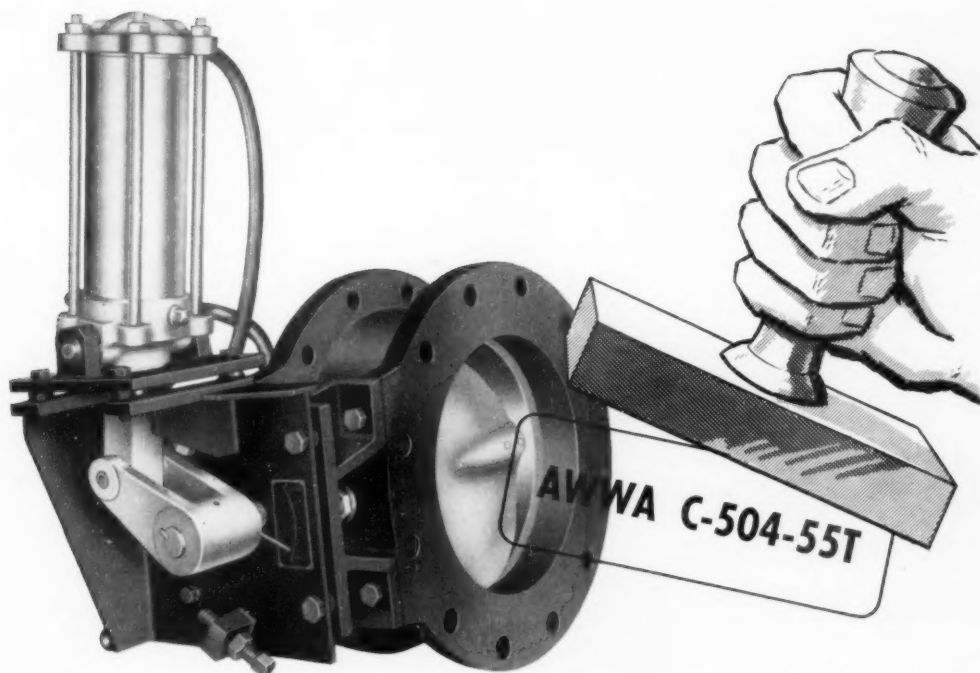
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The country's leading consulting engineers, water works plant operators, and water works equipment manufacturers . . . combining their extensive design, manufacturing, installation and operation experience . . . have prepared exacting specifications for rubber-seated Butterfly Valves.

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- ✓ Extra-rugged body construction.
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PUBLIC WORKS for July, 1956

To order these helpful booklets check the reply card inside front cover.

Engineering Data on The Spiraflo Clarifier

366. Helpful engineering data on the Spiraflo clarifier are presented in 8-page Bulletin 6791 by Yeomans Brothers Co., 2000-1 N. Ruby St., Melrose Park Ill. Details on operation of the unit, performance data, typical plan and elevation, detention time curve and mechanical specifications are included in this useful publication. To get your copy just check the reply card.

Combat Unpleasant Odors At Municipal Sanitation Sites

404. Malodors at municipal refuse disposal sites, waste treatment plants and incinerators may be effectively "neutralized" by the odor masking products of Rhodia, Inc. Be sure to investigate this means of eliminating complaints from unpleasant odors. Write Rhodia, Inc., 60 East 56th St., New York 17, N. Y. or check the reply card.

Helpful Bulletins Give Sludge Pump Details

318. "Scrub-Feller" sludge pumps for handling thick primary sludge, cutting up all solids as they pass through the pump, described with illustrations of details in a 20-page Bulletin 1908B. Standard non-clog pumps are described in Bulletins 126E and 127D. Get them from Chicago Pump Co., Dept. J, 622 Diversey Pkwy, Chicago 14, Ill., by checking the reply card.

Getting Improved Sludge Dewatering With Non-Clogging Vacuum Filters

425. Latest information on the Komline-Sanderson "Coilfilter," which features non-clogging, permanent filter media to obtain constant output and low operating cost is presented in illustrated Bulletin No. 102 by the Komline-Sanderson Engineering Corp., Peapack, N. J. Be sure to investigate this improved method of sludge dewatering. Check the reply card today.

Solids Pump Uses Recessed Impeller

428. The Wemco "Torque-Flow" solids pump works with a completely recessed impeller which creates a vortex effect and transmits power exactly as in a fluid type torque converter. This avoids flow through impeller vanes and reduces clogging difficulties when handling sewage sludge or abrasive materials. For full details get Bulletin SP-10 by writing to Western Machinery Co., 760 Folsom St., San Francisco, Calif., or check the reply card.

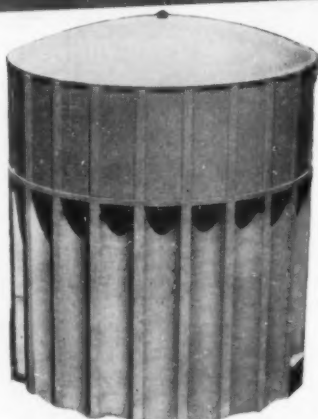
New Catalog on Flexible Compression Fittings

453. This 12-page catalog, well illustrated both by photographs and drawings, highlights the use of these fittings on steel piping and copper tubing. Illustrations taken from case histories and featured throughout the catalog, will be of special interest to equipment designers and piping engineers. Get your copy from Dresser Mfg. Div., Bradford, Pa., or check the handy coupon.

THIS PRELOAD tank

"Rides on Rubber"

To eliminate friction and to reduce restraint at the base of the tank wall which causes vertical bending moments, the wall rests on giant rubber pads. A rubber water stop passes between the footing and wall. These features lick the twin major problems of permitting the wall to move inward or outward due to prestressing and changes in water level and leakage at the base joint. Our Report 1-A gives interesting illustrated details on these features.



2-million gallon prestressed concrete tank on 83' tower at Dallas.

ADVANTAGES TO YOU

- 20 years of PRELOAD experience in designing and building over 1,000 water tanks are your guarantee.
- Maintenance-free; nothing to deteriorate or protect.
- Aesthetic possibilities unmatched by any other materials for architectural treatment.
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PRELOAD through its own sales engineers or through the licensees is available for consultation. Technical data and literature available on request.



The Preload Company, Inc.
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STREET LIGHTING AND TRAFFIC CONTROL

Investigate These Street Lighting Standards

54. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy reply card. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

Modern Lighting for Sports Events

133. Helpful engineering data on standardized "Sportlighting" are provided in a comprehensive 56-page manual issued by Westinghouse Electric Corp., Lighting Div., Cleveland, Ohio. Floodlight layouts and floodlighting equipment are shown for baseball, football and softball fields, tennis courts, golf driving ranges and many other outdoor and indoor sports activities. Application suggestions show how lights may be mounted and wired for best results. Get this authoritative booklet, No. B-5872, by checking the reply card.

Valuable New Floodlighting Catalog

403. A 16-page catalog containing information on tapered steel and aluminum Monotube floodlighting poles designed for use in lighting outdoor sports activities, commercial and industrial areas and parking lots, has just been issued by The Union Metal Mfg. Co., Canton 5, Ohio. Easy-to-read diagrams, illustrations and applications are included. Check the reply card.

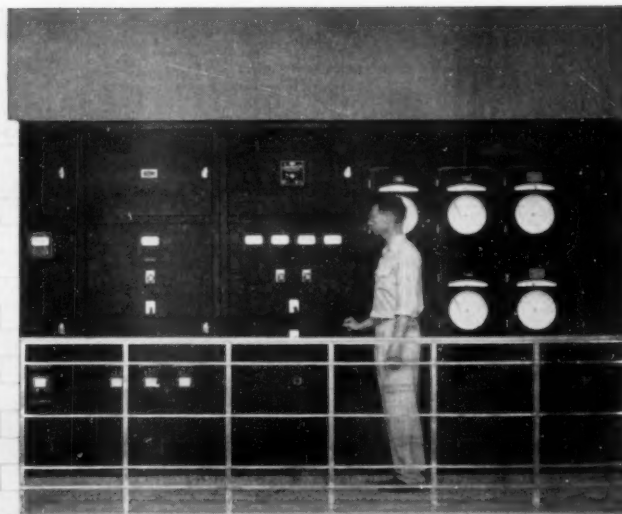
General Electric Bulletin on Turnpike and Expressway Lighting

445. A new 28-page bulletin dealing exclusively with the lighting of turnpikes and expressways is now available from the General Electric Co., Schenectady 5, N. Y. The publication, designated GED-3001, has separate sections on the lighting of toll plazas, interchanges, service areas, main traffic lanes, bridges, tunnels and viaducts. Check the reply card today.

CIVIL DEFENSE

Effective Warning Signals Help Safeguard Communities

374. Nation-wide encounters with floods, windstorms and fires have demonstrated the multiple advantages of air raid warnings and signal systems as a means of summoning civil defense and rescue squads to deal with natural disasters. Get complete information on efficient size and spacing of sirens from Federal Sign and Signal Corp., 8733 So. State St., Chicago 19, Ill. Check the reply card.



3300-TPA-2158



BEFORE



AFTER

Are there control hazards in your plant?

These are the questions which should be checked on regularly: How *safe* is the motor control system in your plant? How *reliable*? How *effective* in handling short circuits? How *capable* of meeting increased load requirements?

E-M engineers have made a specialty of solving problems such as these. For example, the E-M Magnetic HI-FUSE (High-Voltage, High-Interrupting Capacity) Control will give your plant a completely modern method of motor operation and protection. Shown above is a typical HI-FUSE Motor Control which replaced the old equipment at left in the Council Bluffs, Iowa Waterworks.

And this is how HI-FUSE eliminated the hazards marked "X" in the old picture:

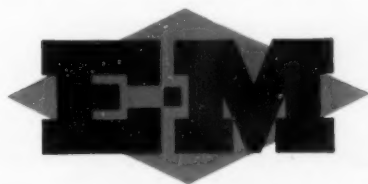
1. HI-FUSE current-limiting power fuses provide short-circuit protection to motor, control and power system.
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3. Nothing "hangs out" . . . no danger to unauthorized personnel with HI-FUSE modern enclosed cabinet design.
4. HI-FUSE operation is "push button" magnetic . . . accurate, convenient, reliable.
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Installed in single units or in group line-up, E-M HI-FUSE Controls are pre-engineered, economical "packages" with a clean, sharp appearance. You can select oil switches or air-break contactors, as HI-FUSE offers both.

To see how this reliable control system will work in your plant, contact your nearest E-M sales engineer. Also, write for new E-M Synchronizer No. 39, "ABC of Large Motor Control".

ELECTRIC MACHINERY MFG. COMPANY
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"X" MARKS THE OLD CONTROL HAZARDS THAT WERE eliminated at Council Bluffs: 1. Inadequate protection to electrical equipment. 2. Exposed disconnects. 3. Exposed wiring, unenclosed sides and rear. 4. Manual operation, subject to human fallibility. 5. Old style meters, too high and hard to read. All of these were *eliminated entirely* by the modern E-M HI-FUSE Control installation described at right.



Specialists in making controls do
EXACTLY WHAT YOU WANT THEM TO

PUBLIC WORKS for July, 1956

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CONSTRUCTION EQUIPMENT AND MATERIALS

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, and is available from Reed Mfg. Co., Erie, Pa. Check the reply card.

A 1-Bag Capacity Concrete Mixer

72. A catalog describing the Model 6-S Dandie concrete mixer is available from the Kwik-Mix Co., Port Washington, Wisc. Printed in attractive colors, it explains the many construction and operating features of the 1-bag mixer. Also included is information on other sizes. Check the handy reply card.

Cut Road Building Costs With A Tamping-Leveling-Finisher

175. For a full description of roadbuilding methods with a tamping-leveling-finisher which lays a smooth mat without forms, tamping and compacting to desired grade, get Bulletin 879-A from Barber-Greene Co., Aurora, Ill. Check the reply card today.

A Fully Rotary Compressor by Jaeger

209. Complete information is available from The Jaeger Machine Co., Columbus 16, Ohio on this 2-stage, oil-cooled rotary compressor. Features include 80% fewer moving parts, up to 30% less weight, vibrationless operation and 100° cooler air. For full details check the reply card.

Examine a Tractor Piece by Piece

99. The 32-page catalog published by International Harvester Company should be studied by every tractor owner, for in it each unit from engine to track of the TD-2 Diesel is considered separately. These piece by piece discussions are supplemented by notes on easy servicing, versatile applications and attachments for every need. Get your copy of form CR-113-A from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or check the handy reply card.

A Tractor-Air Compressor Unit

140. "Around the Clock, Around the World" is the title of an 8-page bulletin describing Le Roi's new 125 Tractair, a self-propelled compressor unit with flexible tractor power. Applications, uses, attachments and tools, design and specifications of the compressor and engine are listed. Write Le Roi Division of Westinghouse Air Brake Company 1706 South 68, Milwaukee 14, Wisconsin, or check the reply card for your copy.

Trencher Fits Municipal Needs

315. A bulletin describing the Cleveland Model 95 trencher has been published by the Cleveland Trencher Co., Cleveland 17, Ohio. The Model 95, called "The standard machine for city and suburban work", is versatile, maneuverable and economical for use on water lines, service lines, road widening and all utilities trenching. Get this 8-page illustrated bulletin by checking the reply card.

Information on An "All-Purpose" Municipal Paint

423. Whether the requirement be traffic paint, sewage plant, exterior finishes for masonry buildings, or interior protection for metal equipment send for literature issued by Cellulose Products Dept., Hercules Powder Co., 978 Market St., Wilmington 99, Delaware, on Parlon. This chlorinated rubber paint shows good resistance against coal gas, chemicals and chemical fumes and salt water atmosphere. Check the reply card today.

Makes Underground Pipe Installation Easy

115. One-man operated hydraulic pipe pusher, pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts ask for Form E-213 Greenlee Tool Co., Rockford, Ill. Just check the reply card.

The Indoor-Outdoor Crane of Many Uses

226. Literature has just been released on the new Austin-Western hydraulic crane that has many uses either indoors or outdoors and is available from Austin-Western Works, Baldwin-Lima-Hamilton Corp., Aurora, Ill. Dimensions, performance data, attachments, special equipment and specifications are fully covered. Check the reply card.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. The larger model is available with air power unit to eliminate manual pushing. Get full details by checking the reply card. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

Handbook of Castings

For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the reply card today.

Side Boxes

For Pick-Up Trucks

476. All-steel, welded side boxes that can be mounted on any make or model of pick-up truck, which converts your "pick-up" to a modern service truck are described in literature available from Stahl Metal Products, Inc., 3490 W. 140th St., Cleveland 11, Ohio. Check the reply card today.

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ANTHRAFILT FILTER MEDIA

TECHNICAL ADVANTAGES

- 1—Requires an average of 40% less wash water
- 2—Completely eliminates mud balls
- 3—Eliminates cracking or shrinking of the beds
- 4—Produces "new" filter media after short period of normal operation
- 5—Turns out purer, better tasting water
- 6—Low installation cost
- 7—Low operating cost
- 8—More water through the filters
- 9—Less "time out" washing filters

PALMER

FILTER BED AGITATORS

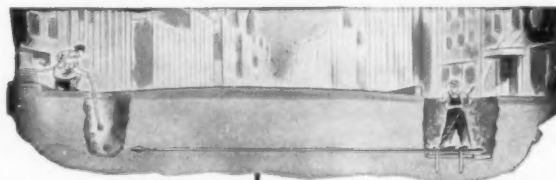
FAR SUPERIOR to Sand or Quartz Media, as it Double length of Filter runs, nearly halves wash water needs; with less coating, caking, or balling.

Filters are in service more as wash water cycle shorter. Better removal of bacteria, taste, odor. Increased Filter output, better effluent. Ideal for industrial acid and Alkaline solutions. Ask any user.

PALMER FILTER EQUIPMENT CO.

822 E. 8th St. • Erie, Pa.

Trojan Pipe Puller & Pusher installs or renews pipe under pavement in half the time required by any other machine!



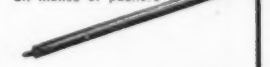
MODEL A for
1/2" to 1" pipe



MODEL B for 2"
pipe and under



PUSH PIPE fits
all makes of pushers



Exclusive continuous action, which eliminates all resetting of grip, does the trick!

The Trojan combines pushing and pulling operations in one machine — keeps pipe continuously moving — lets you install 40' services in as little as 20 min.

Model A needs only 5' trench. One man can easily install the average service. 15 tons of pushing pressure possible.

Model B is reversible in 30 seconds — has 3 speeds for different soils. New dog with individual inserts cuts maintenance.

Write today for full details!

The TROJAN Manufacturing Co.

1114 Race Drive • Troy, Ohio

NOW! A complete line of equipment to meet your exact collection needs!



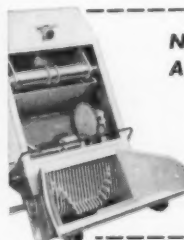
LOAD-PACKERS® The original packing-type refuse collection units! Preferred by over 2600 municipalities for fast loading, positive compaction, low maintenance costs, better service. Fully hydraulic for long life . . . fully enclosed for greater sanitation. Unmatched for narrow alley operation. Write for booklet W-171 that describes all six Load-Packer models, with capacities from 10 to 24 cubic yards.



SPEED-PACKERS® First continuous loader that crushes, shreds and compacts to handle far greater payloads! Non-selective . . . handles tires, lumber, concrete blocks, tree limbs, anything the Speed-Packer can get its 46 teeth into. Exceptionally low maintenance costs . . . combines speed with safety. New 16 and 20 cubic yard models are described in booklet W-195. Write for your copy.

Modern refuse collection service costs less with Gar Wood's advanced and complete line of equipment. You can choose the exact size and type you need to handle *your* collection requirements best. All eight models are built and backed by Gar Wood, the originators of packing-type collection equipment. All are designed for low maintenance costs . . . many parts are interchangeable. And, all are sold and serviced by one world-wide organization of leading truck equipment distributors.

Find out how you can provide modern refuse collection service at less cost with the world's first and only complete line of equipment. Call your Gar Wood-St. Paul truck equipment distributor, or write to: Customer Service Department, Gar Wood Industries, Inc., Wayne, Mich.



NEW SPEED-PACKER TAILGATE Available as Replacement Part!

Your present LP-216 and LP-220 Model Load-Packers can be easily converted into continuous loaders. Ask your dealer about Gar Wood's revolutionary Speed-Packer Conversion Plan.

GAR WOOD INDUSTRIES, INC.

Wayne, Michigan • Richmond, California

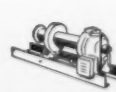
Plants in Wayne and Ypsilanti, Mich.; Findlay, Ohio; Mattoon, Ill.; Richmond, Calif.



Gar Wood - St. Paul
Hoists & Bodies



Gar Wood-Buckeye
Ditchers



Gar Wood
Winches



Gar Wood-Buckeye
Spreaders

To order these helpful booklets check the reply card inside front cover.



TWO PIECE
sliding or screw type
cast iron valve boxes
for covering 4" thru 10"
valves for water or gas.
Rugged construction
for lifetime service.
5/4" shaft. Extensions
as required.

**Adjustable
VALVE BOXES**

THREE PIECE
valve boxes supplied
with separate bases
are available in sliding
or screw type. Made
with 5/4" and 7" shafts
with extensions as re-
quired. Complete line
of service and road-
way boxes.

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ANNISTON, ALABAMA

APCO

*When this Nameplate
goes into place . . .*



**YOU KNOW
YOU HAVE
the Best**

**ROBERTS FILTER
MANUFACTURING CO.**

640 COLUMBIA AVE.
DARBY, PA.

New Acker Vane Shear Tester

367. A bulletin describing a new inexpensive accurate technique for obtaining "in-place" shear readings of soils is available from Acker Drill Co., Inc., Scranton 3, Pa. The shear test kit has a complete set of vane test tools for testing soils to depths of 100 ft., and operating information on this kit is covered in Bulletin 700, available by checking the reply card.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication. Check the reply card for your copy.

Handbook on Hot Rolled Carbon Shapes and Plates

412. A handbook every engineer should have on hot rolled carbon shapes and plates has just been released by United States Steel Corp., 525 William Penn Plaza, Room 5118, Pittsburgh 30, Pa. Check the handy reply card.

How to Select Paints For Every Maintenance Need

467. Selecting the right paint for each maintenance need involves consideration of the service to be rendered, conditions of their use and abuse, and the surfaces to which they are to be applied. To help you determine what to use on various surfaces, an industrial paint index printed in the form of a handy file folder has been prepared by the Tropical Paint and Oil Co., Cleveland 2, Ohio. Get a copy by checking the reply card.

STREETS AND HIGHWAYS

How to Select Prestressed Concrete Bridge Members

26. Colorful folder, well illustrated, shows manufacture of "Amdek" prestressed bridge members and provides selection tables covering several AASHTO loadings. Full data from Concrete Products Div., American Marietta Co., 104 East Ontario St., Chicago 11, Ill. Check the reply card for your copy of this helpful reference bulletin.

Fast Marker for Traffic Guide Lines

474. Free-floating, adjustable paint shields on the Mark-Rite Econo-Liner follow surface contours and produce sharp lines in any width from 2" to 6". This machine is said to paint 10,000 to 15,000 feet of line per hour. For details get Form E-100 from Unimasco, Inc., 5211 Pacific Blvd., Huntington Park, Calif.

What You Should Know About 6-Wheel Trucks

53. Full information on 6-wheel trucks, both conventional and cab-over-engine models, is contained in a new 24-page catalog now available from Motor Truck Div., International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. Full color and two color treatment are employed throughout the catalog to present design and operating features of the many different lines of trucks. To get your copy of this valuable catalog check the handy reply card today.

Useful Attachments for "Payloador" Tractor Shovels

95. Increased versatility for Hough "Payloador" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade snow plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc. Check the reply card today and full details will be sent.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2 1/2" to 14 1/2" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydratrac Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered. Check the reply card.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving captions show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept. PW, Warren, Ohio. Use the reply card to get your copy.

The Modern Approach to the Brush Problem

222. Eliminate your brush disposal problem by using an Asplundh Chipper. For complete information on what the Chipper can do, how it can save on costs, various types available and other outstanding features write to Asplundh Chipper Co., 503 York Road, Jenkintown, Pa., or check the reply card.

Economical Scraper Handles Many Heavy Jobs

398. Among the many applications of the versatile Model D Tournapull are: grading and building roads; handling garbage disposal; and grading, leveling and terracing. For details on how its speed, power and ability to work either as a self-loading tool can help your production and lower your costs, write Le Tournau-Westinghouse Co., Peoria, Ill., or check the reply card.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem, reduce troublesome brush and trimmings to tiny, easy-to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass., or check the reply card for your copy.

Valuable Information On Aerial Surveys

437. What you should know about aerial surveys is described in detail in the latest literature just released by Alster and Associates, 6135 Kansas Ave., Northeast, Washington 11, D. C. Topographic maps, mosaics and planimetric maps by aerial photograph are fully illustrated. For more information check the reply card.

Self-Propelled Ditching Machines

438. Information on a self-propelled one man operated ditching machine, model 524 T, and a new midget ditcher, model 4 T, for light construction is now available from the Vermeer Mfg. Co., Pella, Iowa. The Model 524 T digs 8 to 24 inches wide and down to 6 feet deep, while the model 4 T digs 6 to 14 inches wide and down to 4 1/2 feet deep. Full data on these ditchers available by checking the reply card.

Power Shovel, Crane and Backhoe All in One Unit

441. A completely hydraulic backhoe, shovel loader and crane all in one unit is described in literature available from the Badger Machine Co., Winona, Minn. Also information on front-end loaders, truck and trailer mounted hydraulic backhoes and various attachments that are useful for contractors, municipal and county engineers and state highway engineers. Check the reply card.

Catalogs on Street Sweepers and Flushers, Bituminous Distributors and Maintenance Units

470. Catalogs which feature photos and detailed specifications of street sweepers, flushers, bituminous distributors, gravity sprinklers and maintenance units have just been released by the Municipal Supply Co., 2508 South Main Street, South Bend 23, Indiana. Standard and optional equipment are listed for each piece of machinery. Get your catalogs by checking the reply card.



Comminutor installation serves 7 years with only routine maintenance

In Madison-Chatham Sewage Treatment Plant, money saved by low installation and maintenance costs helps pay for Worthington comminutor and other public works.

"Since 1948, when our Worthington comminutor was installed, it has operated successfully with only routine maintenance. The comminutor's reliability has proved a real blessing for our plant operation."

So says Ed Molitor, Plant Superintendent, about the 25-inch comminutor in service at Madison-Chatham, N. J., Joint-Meeting Sewage Treatment Plant.

Mr. Molitor isn't alone in his opinion of the rugged Worthington comminutor. We've had similar reports wherever they're used—and that covers the country.

Learn about all the advantages of the Worthington comminutor. Contact your nearest Worthington District Office or write today for Comminutor Engineering Manual, W-317-B17, Worthington Corporation, A&SP-Public Works, Harrison, N. J.

WORTHINGTON



ALL MAJOR PUBLIC WORKS EQUIPMENT UNDER ONE RESPONSIBILITY

WATER WORKS PUMPS • SEWAGE PUMPS • COMMINTORS • VERTICAL TURBINE PUMPS • VACUUM PUMPS

To order these helpful booklets check the reply card inside front cover.

Information on Boring Machines

365. General operating instructions for the Earthworm boring machine, a portable compact unit for underground installation of pipe and conduit, are available in new bulletin just released by Lube Jack Co., P. O. Box 1100, Santa Monica, Calif. Suggested procedures for installing pipe or conduit and a price list are included. Check the reply card.

How to Design Stabilized Bases Using Bitumuls Emulsified Asphalt

379. "Bitumuls for Base Construction" is the title of a 12-page booklet discussing the use of Bitumuls emulsified asphalt for this phase of pavement construction. Step-by-step outline covers laboratory tests of soils. Bitumul quantity requirements, construction procedures and advantages. Your copy is available. Write to American Bitumuls & Asphalt Co., 200 Bush St., San Francisco 20, Calif., or check the reply card.

WEED AND DUST CONTROL

Dust Control Made Easy

30. Details on an effective solution for your dust annoyance problems are presented in a colorful bulletin. "Gulf Sani-Soil-Set—the modern, proven agent for controlling dust." Get your copy to learn how this long-lasting, easily applied material can be of help. Write Gulf Oil Corp., 1822 Gulf Bldg., Pittsburgh 30, Pa. or check the reply card.

How to Cut Weed Control Costs

306. Information on a weed killer that can save hundreds of man-hours of clearing and cutting is available from Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio. Whether you want to control weeds or brush or both, without damage to crops or ornamentals, get this literature today by checking the reply card.

Dustproofing Roads with Calcium Chloride

429. Elimination of dusty road problems, reduction of aggregate loss and savings on road blading operations are discussed in the bulletin "Wyandotte Calcium Chloride for Dustproofing." Also included are helpful data on quantities required for many types of surfaces. Write Wyandotte Chemicals Corp., Wyandotte, Mich., or check coupon for a copy.

REFUSE COLLECTION AND DISPOSAL

Sanitary Landfill

Operation and Methods

28. The location and area requirements for sanitary landfill, operation methods for trench type and area fills, equipment selection and costs are items discussed in an 8-page booklet issued by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Be sure you have this reference when considering the problem of garbage and refuse disposal. Check the handy reply card today.

How New, Larger Load-Packer

Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a solution, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check reply card or write Gar Wood Industries, Inc., Wayne, Mich.

Developments in

Refuse Collection

119. The "Dempster-Dumpmaster" system for refuse collection combines the advantages of detachable containers for bulk collection, convenient front-end loading and compaction in a

sealed body. Be sure to investigate the application of this system to your collection needs. Complete data offered by Dempster Bros., Knoxville 7, Tenn. Check the reply card today.

Efficient Material Handling to Reduce Incineration Costs

148. Blaw-Knox Buckets specially designed for refuse and garbage handling are described in 22-page Bulletin 2350-K. Illustrations show progress of material through a modern municipal incinerator plant. Dimensions and incinerator bucket specifications are included. Blaw-Knox Equipment Div., 2124 Farmers Bank Bldg., Pittsburgh 22, Pa. Check the reply card.

Catalog on the Flynn

and Emrich Incinerator Stokers

180. This catalog describes the Flynn and Emrich Incinerator stokers as to design, feeding capacities and loadings. Plenty of drawings of the stokers and photographs of incinerator plants under construction and in operation are included. Also, there is a good section on the incinerator history. Check the reply card today for catalog No. 1702 from Flynn and Emrich Co., Holliday and Saratoga Sts., Baltimore 2, Md.

New M-B Packer Body

Designed for Maximum Payload

309. The M-B Packer Body, designed to provide maximum payload on a minimum size, low-cost truck, features effective, simple compaction system; provides easy loading, positive discharge, all safety features. Available in 12-14-16, 20, 24 cu. yd. capacities. Get all the facts from M-B Corp., New Holstein, Wis.

Check These Features

On Refuse Collection Bodies

363. The Heil "Colectomatic" refuse collection unit incorporates the best features suggested by municipal operating crews, supervisors and private operators to provide easy loading, simple operating mechanism, bulldozer type packing, fast dumping and many other important advantages. Available in 16 and 20 cu. yd. capacities. Check them all by getting attractive Bulletin BH-54103 from The Heil Co., 3044 W. Montana St., Milwaukee 1, Wis. Your copy is ready—just check the reply card.



Weed control saves money here

Chemical weed and brush control pays off anywhere, but especially in hard-to-cut places like this. One spraying not only improves the appearance but saves hundreds of man-hours.

Whatever your weed and brush control requirements, DIAMOND has the information and the solution. As one of the world's largest makers of herbicides, DIAMOND has the experi-

ence and the facilities to help you select the right chemical formulation for the job. For information, write DIAMOND ALKALI COMPANY, 300 Union Commerce Bldg., Cleveland 14, O.



Diamond Chemicals

BIG CITY • BIG DEMAND

BIG RIVER

Solution:

Big Pumps

Capacity 50,000,000 gallons a day

Installed for ST. LOUIS COUNTY WATER COMPANY,
NORTH END PLANT, ST. LOUIS, MISSOURI

Intake Pumps: 4 - 150 hp Peerless 36" single-stage vertical turbine pumps.

Booster Pumps: 8 - 500 hp Peerless 22" single-stage horizontal double-suction pumps.

Here's another installation that convincingly demonstrates Peerless' ability to do the complete pumping job efficiently:

vertical pumps for water supply

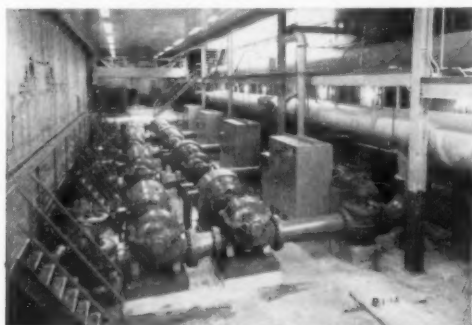
horizontal pumps for water pressure

Either way you look at a pumping job—towards horizontals or towards verticals—follow the lead of consulting and water works engineers everywhere. Select Peerless horizontal and vertical pumps from one of the most complete lines of high quality, water handling pumps offered by any manufacturer.

Remember: Peerless builds dependable pumps for all water handling services—supplying, circulating, dewatering, drainage and flood control protection—and for all applications—municipal, industrial, commercial and domestic.

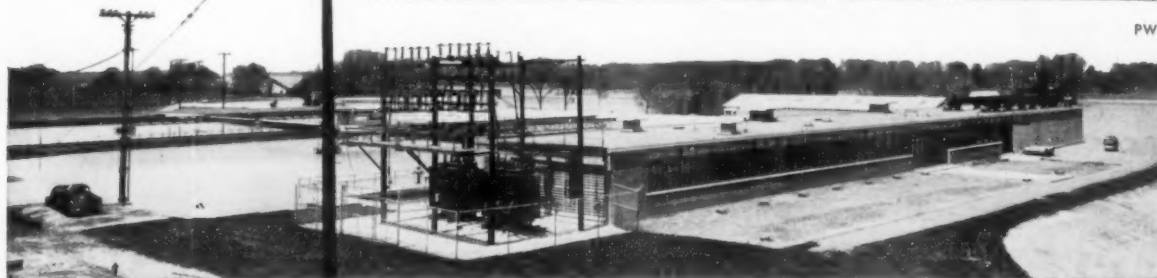


BIG VERTICALS—The middle 2 of these 36" single-stage Peerless vertical intake pumps are driven by 150 hp induction motors. The other 2 pumps (same specifications) are driven by wound rotor motors.



BIG HORIZONTALS—These 8 Peerless horizontal single-stage, double-suction pumps are driven by 500 hp motors. Mounted in series, these 22", high service pumps maintain pressure at required standard.

BIG PLANT—View of the North End Plant, St. Louis County Water Company. A model of planning and efficiency, this is one of the nation's "show place" filtration stations.



PUBLIC WORKS for July, 1956



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PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
301 West Avenue 26, Los Angeles 31, Calif.

PLEASE SEND PUMP BULLETINS DESCRIBING

☐ Peerless Horizontal Pumps (Bulletin B-1300) ☐ Peerless Vertical Pumps (Bulletin B-505)

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21

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you should use

HARBORITE®

for street and highway signs

- ✓ **WATERPROOF**—The original boat hull plywood with 100% waterproof glues. Can't come apart.
- ✓ **WEATHERPROOF**—Bake it, boil it, freeze it—stays like new for years and years.
- ✓ **WON'T CHECK**—Smooth overlay completely hides wood grain. Perfect paint-holding surface.
- ✓ **RESISTS DENTS**—Tough surface and solid wood absorbs worst punishment.
- ✓ **WON'T SPLIT**—No matter what the weather, stays solid, smooth.
- ✓ **WON'T BEND**—Vandals can't wrap this material around sign post.
- ✓ **WON'T CRACK**—Take an ax to Harborite—it won't fail.
- ✓ **WON'T RUST**—No rust to shorten sign life.
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- ✓ **HEAT, COLD-RESISTANT**—Won't warp or change dimension in extreme climate changes.
- ✓ **STIFF, FLAT**—The perfect surface for silk screening.
- ✓ **GREAT STRENGTH**—Pound for pound, stronger than steel.
- ✓ **LIGHTWEIGHT**—Easy to store, handle and erect.
- ✓ **PERFECT PAINTABILITY**—Less paint absorption. Better, more economical paint surface.
- ✓ **EASY TO WORK**—Cuts into any shape with ordinary wood tools.
- ✓ **LESS FRAMING NEEDED**—Inherent structural strength reduces bulky, expensive framing.
- ✓ **LARGE SIZE**—Standard 4' x 8'; extra length solid panels to 12'; oversized scarfed panels available on special order.
- ✓ **CHOICE OF THICKNESS**—From 3/16" to 1 1/4".
- ✓ **MODERATE COST**—Extra sign life and durability reduce cost to rock bottom.
- ✓ **RE-USES**—High salvage value proved by major users.
- ✓ **LONG LIFE**—Actual cases of 8 yrs. outdoor use with no breakdown. Potential life unlimited.

HARBORITE IS UNMATCHED BECAUSE OF EXTRA CARE IN MANUFACTURE:

NO TROUBLE-MAKING CORE GAPS TO REPAIR!
Solid cores... always! Every nail or screw bites into solid wood.

WEARS LONGER! HOLDS PAINT BETTER!
Harborite's extra tough surface is harder than most medium density surfaces.

CAN'T COME APART UNDER ANY CONDITIONS!
100% waterproof glue, originally developed by Harbor for boats, seals Harborite forever!

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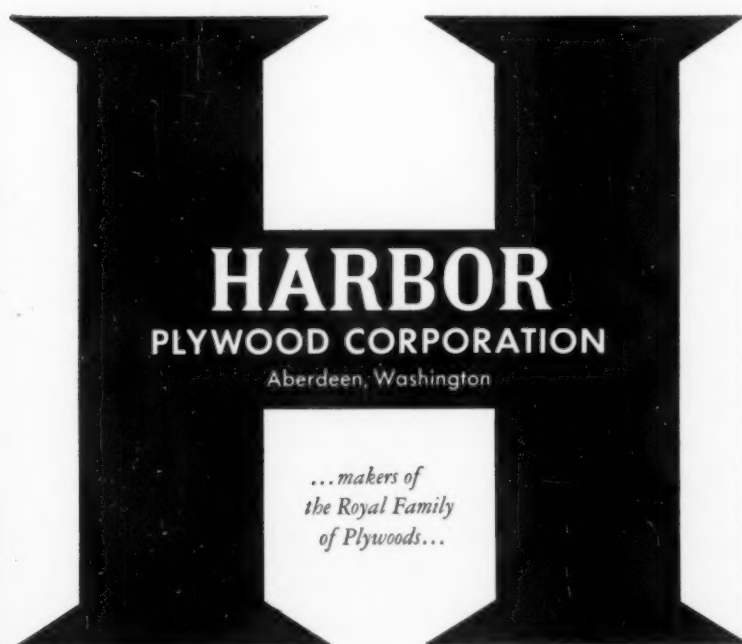
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Other Major Cities.



SIGNS MADE OF HARBORITE LAST LONGER...

LOOK BETTER...COST LESS IN THE LONG RUN!

This miracle overlaid fir plywood...super-resistant to wear, weather and water
...now available in unlimited quantities! The core of this panel is famous Super-Harbord
...all solid wood, no hidden flaws. A medium density resin impregnated
fiber is fused to the face. The result...a plywood miracle!...
super-strong, super-resistant and super-wearing.



**Tests prove Harborite
superior to other
sign materials!**



Exhaustive tests conducted by the Technical Department of the Douglas Fir Plywood Association prove conclusively that overlaid plywood is far superior to other materials for outdoor signs and displays. Signs tested were made of fir plywoods, overlaid plywood, steel, aluminum and glass fiber. These findings have been further backed by state and municipal government tests throughout the country. (Copies of the official test results are available.)

**Now! Harborite competitive in price
with marine type fir plywoods!**

HARBOR PLYWOOD CORPORATION
Aberdeen, Washington 7 PW

Check One or Both:

- ☐ Please send copy of Douglas Fir Plywood Association test booklet.
- ☐ Please forward sample of Harborite and additional information.

Name _____

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*write for free literature and the name
of your nearest Harborite dealer... ►*



FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads,
tracks, lawns with a timesaving
GREENLEE HYDRAULIC PUSHER

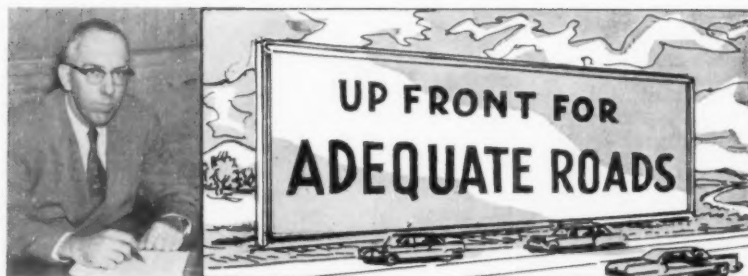
Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.



Two feet per minute average pushing time
GREENLEE Pushers are available in two sizes: No. 790 for 3/4" to 4" pipe . . . No. 795 for pipe over 4", concrete sewer pipe, large ducts. Average performance of No. 790, shown above with power pump, two feet per minute. Write for literature.



GREENLEE TOOL CO.
2047 Columbia Avenue • Rockford, Illinois



by **LEO J. RITTER, JR.**
Highway Consultant

Memphis Parking — A new Transit-Park plan was placed in operation in Memphis early in May. The "TP" plan is a public service gesture by 33 Esso Standard Oil service station dealers, who made available 886 parking spaces to motorists who park outside the central business district and ride public transit vehicles to and from their final downtown destinations. Available parking spaces are in various locations over the city, with transit time from the different lots to the heart of the downtown area ranging from 8 to 50 minutes. The idea, of course, is to help keep private cars out of the business district and encourage transit riding.

Reflection Cracks — What do you do about sealing reflection cracks in bituminous concrete overlays on old concrete pavements? They seem to be inevitable, unless some preventive step is taken, like the incorporation of wire reinforcing in the overlay. We have recently become interested in the problem, and there seems to be a dearth of information on the subject. How about letting us know what your practice is? What kind of sealer have you found to be best? How do you apply it? Is it necessary to widen or groove narrow cracks before sealing—and how do you widen them? Any information you have will be greatly appreciated and gratefully received—address it to the writer at 619 N. Washington, Naperville, Illinois.

Speaking of reflection cracking, the March-April issue of California Highways and Public Works carries an interesting account of research which is being done in that state to find means of preventing cracking of this type. Studies involve the use of welded wire fabric, bituminous road mesh, and expanded metal sheets as reinforcement in the bituminous overlay. Field test sections have not yet been in service long enough to permit the drawing

of definite conclusions regarding the relative effectiveness of the various materials used.

Paint Remover — We're not sure how new this sort of gadget is, but the Department of Traffic of the City of New York has recently acquired a traffic-line-removing machine, which erases up to 400 lineal feet per hour. The device operates roughly like a floor-sanding machine, and is guided by an operator over paint or plastic lines at a slow walk, removing the lines in one pass. Engineering estimates reveal that the cost of paint removal by the machine averages less than one cent per lineal foot. The cost for plastic removal is slightly higher.

Airport Pavements — As noted in an earlier column, the Air Force sometime ago announced a decision to curtail construction of asphalt pavements at military airfields, because of failures which were alleged to have occurred at seven heavy bomber bases. Naturally, the asphalt industry was not a bit happy about this turn of events. As a result, a new test airstrip has now been built at Kelly Air Force Base (Texas) and is being subjected to accelerated traffic tests. The test section incorporates thicker asphalt pavements than were used in the sections on which distress was noted, and heavily compacted base and subbase sections. Loading of the test strip is expected to be completed by 1 September.

Another Step — Another pioneer step in the integration of the nation's transportation systems was taken in April, with the inauguration of a new truck-water freight service by the Pan-Atlantic Steamship Corporation, between Houston and New York. In the new plan, loaded truck trailers are being placed directly aboard ocean-going tankers. The scheme is generally similar to the "piggy-back" system being used on railroads. Two T-2 type tankers equipped with special



Now! New Heavy-Duty V-8's!

With the most GO under any truck hood!

V-8 power to cut your costs!

These new 206, 226, 257 hp. modern truck V-8's in the new INTERNATIONAL V-Line have "built-in" reserve power that gets your biggest loads moving *fast . . .* a lively response that keeps them rolling with shifting greatly reduced, even on the most rugged off-highway operations. You save operating costs and you save trip time.

In short, the new INTERNATIONAL V-Line is built to set new highs in your profit column!

Tested and proved as no other trucks have ever been!

Developed and tested in the lab, then put through more than 1,000,000 test-track miles, and in 2,500,000 on-the-job miles in 39 different truck vocations.

These tests were made by profit-minded truckers with a gimlet-eye on mileage, hauling time and repair bills. Their conclusions—"GREAT, on every count!"

3 Great New INTERNATIONAL V-8 Engines!

	V-401	V-461	V-549
Displacement	400.9 Cu. In.	461 Cu. In.	548.7 Cu. In.
Bore and Stroke	4 1/8 x 3 3/4	4 1/8 x 4-5/16	4 1/2 x 4-5/16
Maximum hp.	206 @ 3600	226 @ 3600	257 @ 3400
Maximum Torque	355 @ 1800-2000	420 @ 1600	505 @ 2000

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Servicised White Pigmented Curing Compound provides a film or membrane capable of reflecting heat. It is widely used in areas where atmospheric temperatures exceed 80°F., and properly applied, will reduce concrete temperatures approximately 15°F. Excessively high temperatures during the early hardening period tend to jeopardize setting of concrete and reduces its final strength. High quality inert pigments added to the basic compound also prevent too thin or uneven coverage, as improper application is readily seen. Used on all U. S. Engineers work.

CLEAR TYPE

Servicised Clear Curing Compounds are available in both Wax-Resin and Resin Base Types. Only pure synthetic resins are used with carefully controlled proportions of oils and waxes, etc., in a petroleum solvent to insure a clear, impermeable membrane. Both types can be supplied with a fugitive dye which materially assists in securing proper coverage, and which disappears after application.

WAX-RESIN BASE. A general purpose compound, usually used on mass concrete, pavements. Has excellent water retention properties, allowing slow curing of the concrete which eliminates checking. Dries rapidly and forms a film of uniform texture.

RESIN BASE. Recommended for buildings, offices, architectural concrete, etc. The pure resins, oils and other ingredients present a clear film which does not materially alter the appearance of concrete and it permits early application of adhesives, paint, etc.

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Servicised Air Entraining Agent is a highly active, homogeneous and clear solution. A relatively small quantity produces maximum air dispersion, yet it is not so critical as to create wide fluctuations in the amount of entrained air should slight variations in the amount used occur. It will not settle out in storage or gum the dispenser, and its action is not jeopardized by the presence of Calcium Chloride. Servicised Air Entraining Agent meets all official specifications, comes ready to use and requires no additional ingredients or treatment before being used. Available in 5 gallon and 55 gallon drums.

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cargo decks are being used. Each tanker will accommodate 58 loaded trailer bodies, with each container being 33 feet long and having a load capacity of 40,000 pounds. At the terminal port, each loaded body is simply lifted off the ship and coupled with a trailer chassis; the coupled container and chassis then make up a highway trailer of standard weight and length. As you know, water transportation now is the cheapest form for the movement of many bulk commodities—like grain, crushed stone, ore, and so on. Moves like this may make it even more competitive for certain types of cargo and in certain areas. And if you don't think the St. Lawrence Seaway Project is going to have an impact on the Midwest, you should hear Max Cohen tell of the tremendous improvements which have been and will be made at the Port of Chicago to handle ocean-going vessels and link "middle America" with the four corners of the world.

New Publications — The Eno Foundation for Highway Traffic Control has come up with another of its comprehensive reports on an important problem in the traffic field. This one is called *Parking—Legal, Financial, Administrative*. It is a 200-page book covering such topics as objectives of governmental policy, the metropolitan setting for the parking problem, ascertaining parking needs, legal authority for public off-street parking, methods of financing public facilities of this type, parking facility programs and organization, and relation of land use regulation to the parking problem.

The manual was authored by the Joint Committee on Urban Traffic Congestion and Parking, of which Jefferson B. Fordham is chairman. Address of the Foundation is Saugatuck, Connecticut.

Another very interesting document is one entitled *Federal Airway Plan, 1957-1961*. Issued by the CAA, it sets forth the plans for modernizing the country's airways system to accommodate jet aircraft, and permit a greatly increased number of aircraft movements of all types, and increase air safety. Major and associated components of the airways system are described in some detail. The book is available from the U.S. Department of Commerce, Washington 25, D.C. (price-\$1.00).

From Hither and Yon — John A. Logan, formerly head professor of Civil Engineering, has been named Associate Director of Northwestern

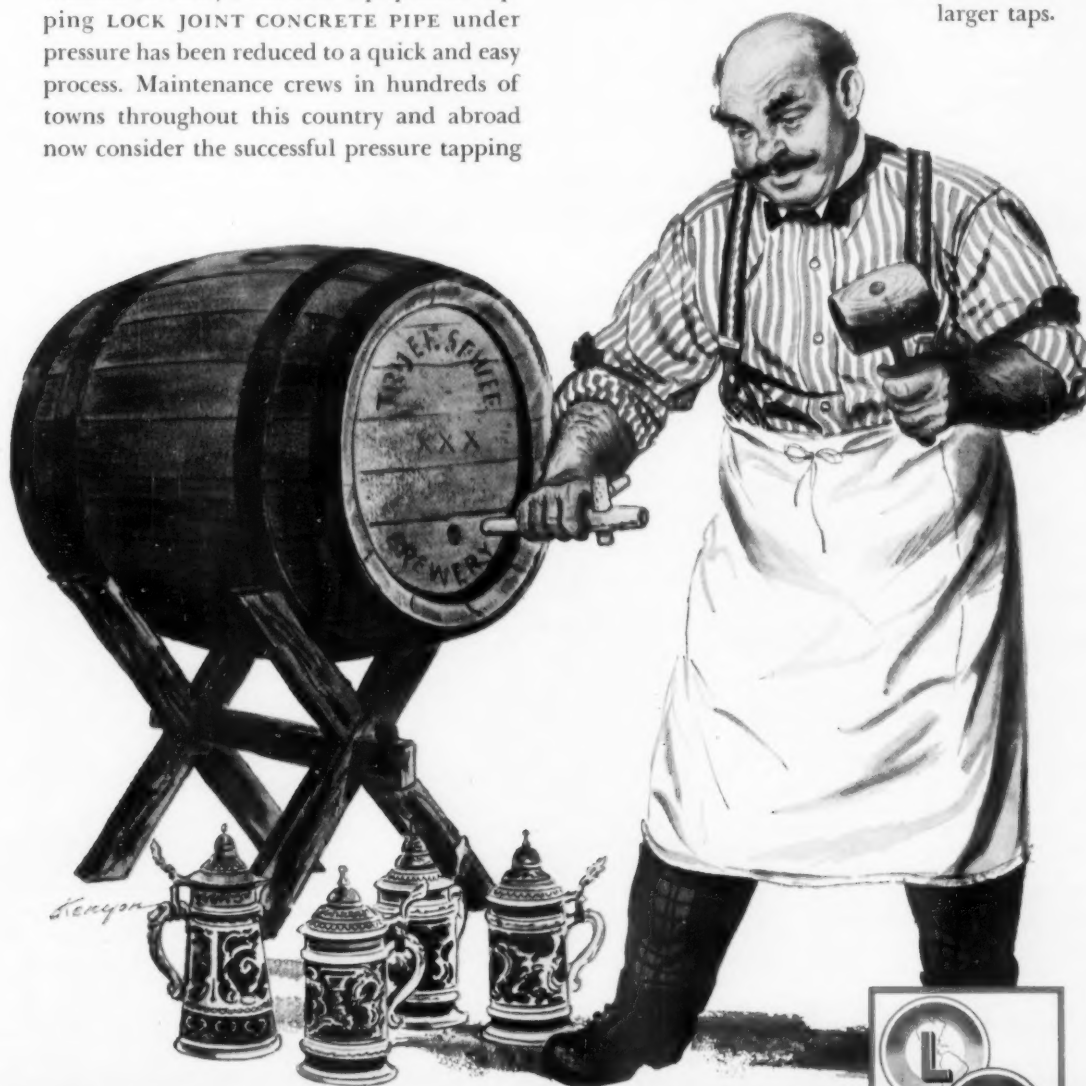
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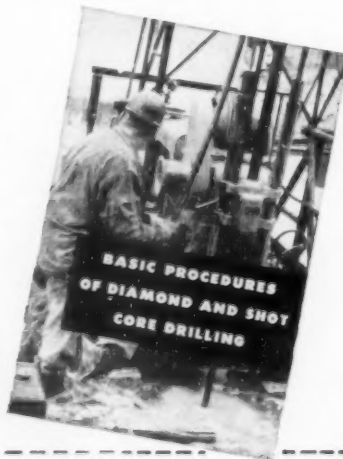
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University's new Transportation Center at Evanston, Illinois. After 33 years of outstanding service, W. A. (Bill) Warrick has retired as Chief Construction Engineer of the Pennsylvania Department of Highways. Midway Airport (Chicago) was the busiest in the country in 1955, for the fourth consecutive year, according to figures recently released by the CAA. In addition to revenue problem, the Ohio Turnpike is experiencing another kind of difficulty, since it is reported that a 300-foot section of the road has sunk several inches into a swamp deposit. The last gap between the Pennsylvania and New Jersey Turnpikes has now been closed, with the opening of the new Delaware River Bridge in May; closing of this gap is expected to cut about 90 minutes off the running time between the Midwest and New York City.

DESIGN AND TESTING OF FLEXIBLE PAVEMENTS

Four papers presented at the 34th Annual Meeting of the Highway Research Board, January, 1955, are included in this bulletin: "Wheel-Load-Stress Computations Related to Flexible Pavement Design," by Chester McDowell; "Design, Construction and Evaluation of Heavy-Duty Runways," by W. H. Campen and J. R. Smith; "Flexible-Pavement Design with Cone Device," by W. A. Wise; and "Pavement Deflections and Fatigue Failures," by F. N. Hveem. Price \$1.65. Copies of Bulletin 114 can be obtained from the Highway Research Board, 2101 Constitution, Washington, D. C.

SUBSTRUCTURE ANALYSIS AND DESIGN

This publication presents the various phases of substructure analysis and design, clearly and logically for the benefit of the readers, the student and the practicing engineer. Throughout the book, emphasis has been placed on applications to the problems of the designing engineer. Facility in setting up mathematical relationships to express stresses in the substructure is best achieved by studying practical examples, and the various illustrative problems form an integral part of the text. The author is Paul Anderson, Ph.D., Professor of Structural Engineering, University of Minnesota. The Ronald Press Co., 15 East 26th St., New York 10, N. Y., is the Publisher. Price is \$7.00.

Planning better roads

by **INTERNATIONAL SALT COMPANY, INC.**—America's largest producer of salt



Stabilization of Gravel Now Required on New York's "Erwin-Program" Roads

The "Erwin Program"—New York's law to provide state aid for the improvement, repair and reconstruction of certain town highways—was recently amended in a most significant way. This law now reads that gravel or other surfacing "shall be stabilized with a suitable binding material..." Formerly, the law simply stated that such surfacing "may be stabilized."

With this amendment to the "Erwin Program" in effect, it is now the job of Town Highway Superintendents and other officials to select the most effective gravel stabilizer for their roads. At the same time, they must also select a stabilizer which is low in cost, readily available, and easy to store and apply.

In a great majority of cases, the gravel stabilizer which meets all these requirements best is rock salt. And, in fact, rock salt has already been widely used

Robert T. Carrier, the use of rock salt as a stabilizing agent has proved unusually successful on his roads. "The gravels in our area," he writes, "are particularly well suited to the use of rock salt, since there is a well-proportioned blend of hard material and clay binder."

Commenting further on rock salt as a stabilizer, Carrier says: "Recent research has shown us that 12 tons of rock salt per mile of road surface gives a satisfactory and long-lasting job. The maintenance of such stabilized sections of road has decreased—leaving more time and money for new construction and reconstruction. Where all-weather surfaces have been placed on these stabilized bases, they have remained sound, and maintenance has been at a minimum."

"Rock salt on our 'Erwin-Program' roads has also increased the density of their bases, eliminating the penetration of water. This, in turn, has reduced the freeze-thaw cycle common to our climate and subsequent frost action. Rock salt provides a good base material for future all-weather wearing surfaces. And, in short, it's helping us to save what we have, and allowing us more time and money to catch up with the ever-increasing demands of traffic."

In New York—and many other states—the product most often chosen for



Sterling Rock Salt was also used on this Genesee County road. It was applied, mixing the top 3 to 4 inches. Other operations: mechanical mixing, blending, wetting, rolling, final blading and rolling.

road stabilization is Sterling Rock Salt, produced by International. This rock salt has all the advantages that city, state and county highway officials demand: it provides positive, long-lasting stabilizing action; it's low in cost; it's easy to store and apply—and it's always readily available when and where you need it.

Sterling Rock Salt, of course, is effective as a stabilizer for road shoulders and bases—as well as the wearing surface. With road bases this product is particularly important because a road is *only as good as its base.*



Genesee County road stabilized with low-cost Sterling Rock Salt. Gravel surface is hard, long-wearing, virtually dustless even in driest weather. Due to Sterling Rock Salt's antifreeze action, this road has unusual resistance to frost penetration.

on many New York State "Erwin-Program" roads—as well as others throughout the state.

One excellent example of rock-salt-stabilization under the "Erwin Program" comes from Genesee County, New York. This county's experience is typical of many where rock salt has helped to provide better roads—at lower costs. According to Genesee County Highway Superintendent



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Rock-salt-stabilization procedures vary with particular soil and road conditions. For expert advice on how stabilization can work in *your* area, contact International. An International "Salt Specialist" will be glad to help you work out an effective, money-saving rock-salt-stabilization program for your system. He'll show you facts and figures on actual road-stabilization jobs now under way. And he'll work with you in lining up such details as application procedures, specs, etc. No cost or obligation. Just contact your nearest International sales office.

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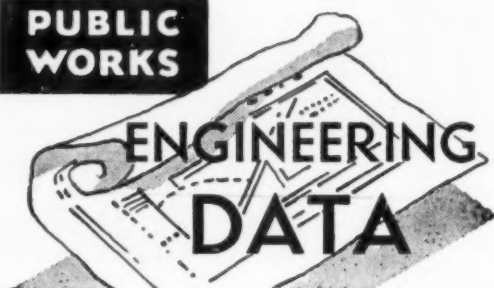
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PUBLIC WORKS



Cost of Laying 6-inch and 8-inch Water Pipe in Toledo

As usual, the Toledo, Ohio, Division of Water, in its excellent annual report gives costs of laying 6-inch and 8-inch water pipe. The average cost per foot for laying 6-inch pipe, based on 15,464 ft., was \$5.48. For short lines, to 500 ft. in length, the cost was \$8.27; for lines 500 to 1000 ft. long, the average cost was \$5.70; and for lines over 1,000 ft. long, the average was \$3.99 per ft. Of the total cost for these lines, 49.9 percent was for materials; 22.7 percent was for pavement restoration and labor; 12.8 percent was for hauling and equipment; 7.2 percent for supervision and overhead; 0.7 percent for assessment fees; and 6.7 percent for engineering.

Included in these percentages were three 8-inch lines totaling 1,465 ft. in length. A line 140 ft. long cost \$8.37 per ft.; another 486 ft. long cost \$7.14 per foot; and a third 540 ft. long cost \$6.67 per ft.

These figures are for the year 1955. Sol Wittenberg is Commissioner of Water for Toledo and George Van Dorp is Chief Engineer of the Water Division. John R. Alspach is Director of Public Service.

Algae Growth in Sewage Oxidation Ponds In California

Observations on the oxidation ponds of the Central Contra Costa Sanitary District and of the City of Santa Rosa, Calif., on pilot plant ponds at Richmond, and on "micro ponds" in the laboratory have shown that the unicellular green algae *Chlorella* and *Scenedesmus* are the photosynthetic organisms most important in the functioning of the ponds.

It has been found that these algae do not grow on sewage in the dark and they do not reduce the content of oxidizable matter in sewage when growing on it in the light. Their development in the ponds is thus possible only by photosynthesis, for which they use carbon dioxide produced in the oxidation of organic matter by colorless organisms.

The maximum algal crop which can be grown on the nutrients present in domestic sewage is 1 to 2 grams dry weight per liter. To obtain any appreciable increase over this figure it is necessary to supplement the sewage with nitrogen as well as with carbon. The algal crop in the large-scale ponds at present in use is usually much smaller than the maximum which can be grown with the nutrients available.

The algal flora present in oxidation ponds can be used as a means of following pond operation, since *Chlorella* (and, to a lesser extent *Scenedesmus*) is the principal alga in ponds in which sewage is undergoing active oxidation. When oxidation is well ad-

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parts problem, helping you to get accurate, thoroughly modern performance from your oldest meters.

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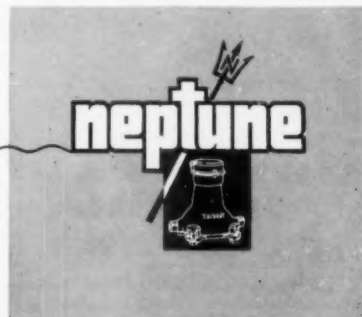
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vanced, *Chlorella* is succeeded by a mixed flora in which *Scenedesmus* and *Chlamydomonas* are important. Some of the factors underlying this algal succession are discussed in the report mentioned in the last paragraph.

Large ponds have been found to operate successfully under a wide variety of conditions. They are to a large extent self-regulating. Experimental ponds designed for maximum algal growth are more efficient, but require more control.

Information on sampling and experimental methods and a detailed analysis of data collected on the oxidation ponds studied are presented in appendices to a report by M. B. Allen, Department of Botany, University of California, to the State Water Pollution Control Board of which Vinton W. Bacon is Executive Officer. Copies of the 48-page report are available from The State Printing Division, Sacramento 14, Calif., at 75 cents.

The Maintenance Work of a Water Department

The following information is from the Annual Report of the Department of Water Supply, City of Detroit. The report covered the fiscal year to June 30, 1955. The maintenance and construction operations of the water department included the following. There are 391,167 meters in service, varying from 5/8-inch to 30-inch in size, an increase of 1501 meters during the fiscal year. A total of 30,756 meters were removed for various reasons, and 33,695 meters were repaired in the meter shop. The cost of materials and labor for repairs was \$195,867.65.

During the year, 3,909 new services were installed ranging in size from 3/4-inch to 12-inch. A total of 746 old service connections were discontinued, leaving a net gain of 3,163 services.

The hydrant division inspected 9,397 hydrants, repaired 739 leaks on hydrants; set 162 new hydrants; replaced 41 defective hydrants; reconditioned 533 in the shop; painted 6,276; thawed out 458; replaced 129 broken hydrants; moved 84; and repaired 215 joint leaks on hydrants during the year. Construction crews installed 26,629.5 feet of pipe and discontinued 16,694.8 feet of pipe during the year.

State Urban Redevelopment Laws

In approximately two-thirds of the states in the United States, legislation has been enacted to authorize cities, redevelopment agencies, housing authorities or other local public agencies to cope with urban slums. These laws, in general, empower such local public agencies to prepare surveys and plans; borrow money and issue obligations as security for loans; accept federal aid; acquire real property in slum, deteriorated and other areas by purchase and condemnation; demolish and remove buildings and other structures in such areas; and clear the areas.

Also these laws generally empower such agencies to prepare the land for redevelopment by providing streets, utilities and other site improvements in the area; sell or lease the cleared land for redevelopment primarily by private enterprise, and impose upon the purchasers and lessees of such cleared land obligations to use the land in accordance with a plan. The constitutionality of these state enabling laws has been upheld by the courts of last resort in many states. This information is from the Eno Foundation For Highway Traffic Control.

A Survey of Standards For Permanent Street Improvements

To collect information for an analysis of the standards now in use in controlling permanent street improvements in new urban residential areas, a questionnaire was mailed to the city engineers of 51 of the 56 cities in the United States with 1950 populations of from 100,000 to 200,000; to the city engineers of the 31 cities in Wisconsin with 1950 populations of 10,000 or greater; and to the city engineers of 9 cities with 1950 populations of from 50,000 to 100,000 in the midwest. As a result of this survey of standards for permanent street improvements in new urban residential areas, and of other research, the following recommendations are made.

- (1) Roadway width—Several standards, based on street types and usage, should be provided for: 10-foot traffic lanes and 8-foot parking lanes are recommended for minor residential streets.
- (2) Maximum percent grade—5 percent; and minimum percent grade—0.5 percent.
- (3) Minimum radii of curves—130 feet for turning speeds of 30 miles per hour and minimum corner radii of 50 feet at intersections for speeds of 20 miles per hour.
- (4) Minimum curb radius at intersections—intersecting streets with parking lanes—15 feet; intersecting streets without parking lanes—30 feet.
- (5) Integral concrete curb and gutter should be used.
- (6) Maximum driveway openings in curbs—30 feet.
- (7) All sidewalks should be constructed of concrete with a width of 4 feet for minor residential streets and a sidewalk thickness of 5 inches; with 6-inch thickness at residential driveways.
- (8) Prohibit the use of side ditches and require the use of enclosed storm sewers.
- (9) Require water mains, sanitary sewers, and storm sewers in all new subdivisions before lots are sold. It is recommended that these utilities be placed in the area between the sidewalk and the curb.
- (10) Control number and placement of utility poles.

Who Owns Garbage?

A man brought before the New York special sessions court because, it was said, he had burned rubbish in a hallway of his building, was freed because the justices failed to answer three questions asked by the Legal Aid Society attorney.

The questions were "Who owns rubbish after it is thrown away?" "Does it have any legal value?" and "How does the burning of garbage decrease its value, if there is any that exists to begin with?" The defendant had been arrested on an arson charge, but the grand jury failed to indict on that charge, returning instead another indictment charging willful injury to property. Attorney Robert Kasanof argued that the rubbish was not owned by anyone since it had been thrown away by a resident and who could prove that garbage had value of even one dollar? The justices ruled it had not been established beyond reasonable doubt that the facts constituted the crime charged. Toledo City Journal.



The attractive new outdoor Beachwood Swimming Pool in Pittsburgh, Pennsylvania is one of the finest examples of modern pool design. Its 328,000 gallon capacity is kept invitingly clear with Adams Poro-Stone Filters.

Another Modern Pool with ADAMS SPF Filters

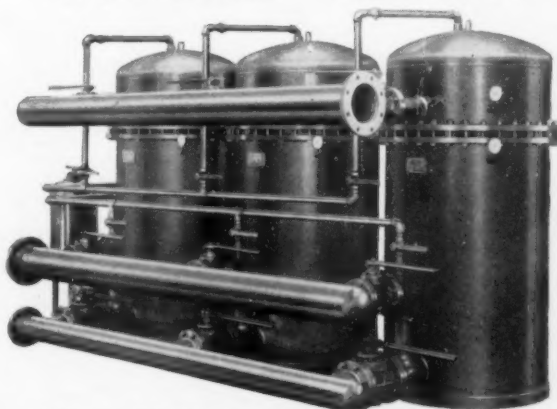
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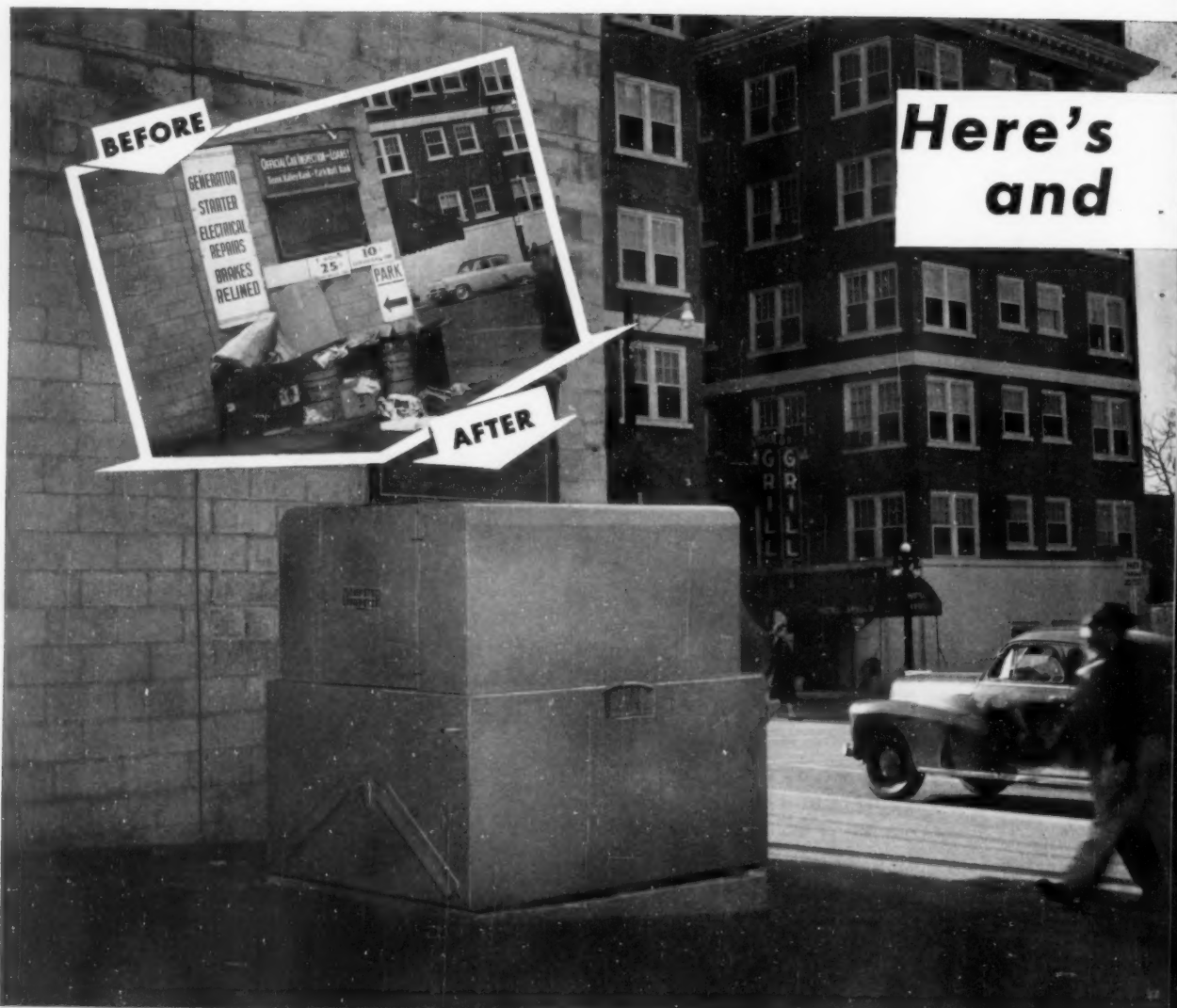
This triple SPF 169 can handle up to 750,000 gallons capacity and is ideally suited for community pools such as is shown above.

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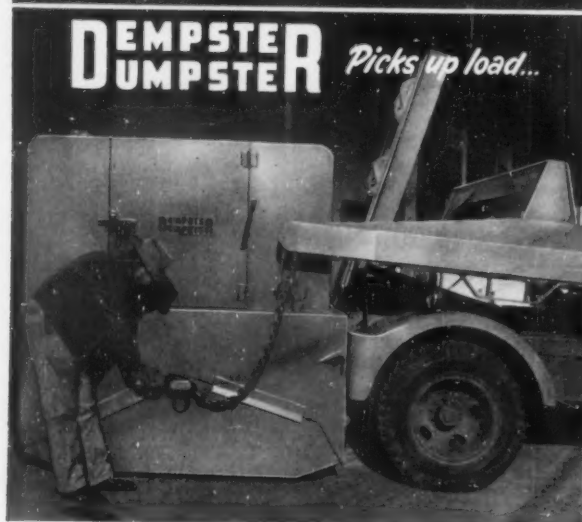
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PUBLIC WORKS for July, 1956

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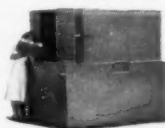
BIG STEEL DEMPSTER-DUMPSTER CONTAINERS—each equivalent to 75 ordinary trash cans—can be located at convenient bulk refuse accumulation points in your business areas . . . in housing and apartment areas . . . at schools, hospitals, etc. Scores of them—25, 30, 40, 50—served on pre-arranged schedule by only one man, the driver of your truck-mounted Dempster-Dumpster.

Invariably, wherever this system is installed, one finds immediate praise of an outstanding improvement from merchant users and citizens alike. Without question, the Dempster-Dumpster System is recognized as the most sanitary and lowest cost method of bulk refuse collection ever devised.

Without obligation on your part, our engineers will be glad to make a comprehensive fact-finding

survey to determine the savings you can expect by the use of this amazing system. For instance, a year ago the system was installed at Borger, Texas "and has proven to be the answer to our trash and garbage problems in the business districts", writes City Manager Fritz Thompson. Now, it is being enlarged and Mr. Thompson confirms what our original survey pointed out that the Dempster-Dumpster equipment is being amortized out of labor savings alone in approximately four years. In nearby Plainview

for another example, Mayor C. L. Abernethy tells us "We have found, as your original survey pointed out, that the labor savings alone will amortize the cost of the Dempster-Dumpster System within the first three years of its operation." Plainview has one Dempster-Dumpster serving 58 containers. Write us today! Dempster Brothers, Inc.



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CATERPILLAR

HOW WATERLOO TURNED GARBAGE DISPOSAL FROM A LIABILITY INTO AN ASSET

Playgrounds reclaimed from dumps, property values increased near homes and a polluted creek filled—these are some of the benefits resulting from nine years of sanitary landfill.

When Waterloo, Iowa, was using the open dump system of garbage disposal, the Mayor often received requests like this: "We're having a party tonight, Mayor. Could you stop burning rubbish at the dump?" Worst of all, the city fathers were constantly worried about possible lawsuits brought about by the unsightly, unsanitary dumps, which were breeding places for rats, flies and vermin.

Many people accepted this condition as a necessary evil. But not Carl C. Fagerlind, Waterloo Street Commissioner, who proposed the sanitary landfill method of disposal. He explained this in terms taxpayers could understand. "You just find a low area and dump your garbage there. You spread the refuse out, then run over it with one of those big crawler tractors. This

squashes everything together, then you cover the refuse with about two feet of dirt. Flies or rats can't get to the refuse and it can't burn.

"The real payoff comes afterward, though. You keep piling layers of dirt and garbage into the low spot, and when it is filled you've got brand-new land for buildings or a park."

The city fathers thought the idea had merit. They told Fagerlind to "Take one of the city's tractors and see what we can do at our present dumping site. We can't spring this on the city until we are sure we know how to operate a successful landfill."

After Fagerlind had convinced them that he had the know-how, the next step was to promote sanitary landfill to other city officials, the park board, the planning commission and influential



Carl Fagerlind, Waterloo Street Commissioner, was the prime mover in the city's adoption of sanitary landfill. About 20 acres of land have been reclaimed since the operation started in 1947.



Turning a dump into a baseball diamond is just one example of the improvements made in Waterloo by use of sanitary landfill. A few feet under this field are tons of garbage.

Waterloo business leaders. The Mayor, actively supporting his Street Commissioner, carried his proposal in a series of talks to service clubs, to the League of Women Voters and the press. Finally, the City Council felt the story had reached enough people and Fagerlind was instructed to go to work on his first project, the Fairview Dump.

This dump, next to beautiful Cedar Rapid Park and just a short distance from the municipal baseball stadium, was overrun with rats. Fires burned night and day and baseball games were frequently interrupted when the outfielders could not see through the fog of smoke that drifted over the field.

Using the landfill method, Fagerlind and his crews converted this public nuisance into a playground. So successful was the conversion that people from



This Caterpillar® D7 Tractor with No. 7S Bulldozer is the mainstay of Waterloo's sanitary landfill operation. Its giant tracks can squeeze refuse to one-fourth of its original size. Good compaction is essential

in landfill. This, plus solid packing of earth over the refuse, eliminates vermin and odors and prevents fires. Eventually, grass seed is sown and the area becomes a community asset.

all sections of the city offered him other sites for reclamation. As a result, among other improvements in the last nine years, there's a dike along the Cedar River that protects about 20 square blocks of a residential neighborhood. This was constructed at a saving of from \$4000 to \$5000 to taxpayers. And an old mill race that cut through another residential section has been filled.

"We worked within 50 feet of residences, but people didn't mind," Fagerlind said. "They felt that while the fill was going in, it was no worse than looking at the gaping 100- to 150-foot trench that sliced through their properties. They thought of the increased property value that would result when the job was finished."

Compaction, Fagerlind feels, is the key to successful landfill. It is neces-

sary to have a good heavy tractor that will crush cartons, tin cans and bottles and thoroughly tamp the refuse before the cover is put on. This eliminates the vermin and reduces the degree of future settling of the land.

Work horse in Waterloo's sanitary landfill program is a CAT® D7 Tractor with No. 7S Bulldozer. Says Fagerlind: "Its cost of operation is very, very low and it does a wonderful job. We had over 4000 hours on it before any major expense was met. And very important, it has the weight for proper sanitary landfill."

Practical information on sanitary landfill, as well as the function of Caterpillar-built equipment in the method, is available from your nearby Caterpillar Dealer. A phone call, card or letter to him will get prompt attention.



Under the landfill method, land can be reclaimed close to homes, increasing property values. The refuse is covered each night under a compacted blanket of earth, so rats and flies can't breed in it and it can't burn.

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MODERN-MINDED code officials welcome the news . . . and are certifying this dependable, acid- and alkali-resistant bituminized fibre pipe.

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PUBLIC WORKS for July, 1956



A.R.B.A. ROAD SHOW and CONVENTION, International Amphitheatre, Jan. 28 to Feb. 2, 1957

Here in Chicago everything is being done to make the coming A.R.B.A. Road Show and Convention an event that will be remembered for its value as an instructive conference, a helpful equipment show and its pleasures. Chicago's vast hotel setup is being organized to care for the large attendance that will be present. The International Amphitheatre is the largest exhibit hall in the Country and will provide an ideal spot for gathering and viewing the over 1,000 pieces of equipment that will be shown.

The Stock Yards Inn with its many eating places and cocktail lounges, and the cafeterias in the Amphitheatre, assure comfortable restaurant facilities.

Free Bus Service from the main hotels will assure adequate transportation and permit attending convention sessions regularly and at the same time allow you to spend time at the show.

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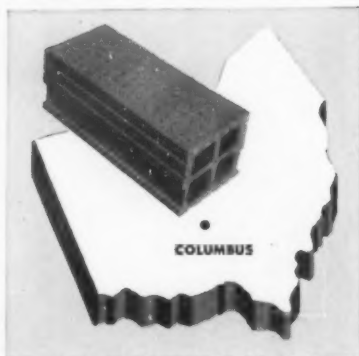
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LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD,

Dr. Eng. Sci., LL. B.

Registered Professional Engineer

A Flood of Litigation

In *Gruntorad v. Hughes Bros., Inc.*, 73 N.W. (2d) 700, a Nebraska case decided Dec. 9, 1955, the owner of land upstream from a city sought an injunction to compel the abatement of a "nuisance" created by a flood control project further downstream. The purpose of the flood control project was to protect 105 acres of land of which 104 were within the City of Seward. There were 37 city blocks; 16 business and 74 residence properties; the municipal water works and swimming pool; and the Hughes Manufacturing Co. for which protection was provided. The area had been inundated several times before the project was instituted. The flood control works for the City of Seward were designed by the Army Corps of Engineers. The Federal government contributed \$147,200, and local interests including Hughes Bros., Inc., provided the balance of \$200,500. The City was required to and did give the Secretary of the Army assurance that it would maintain and operate the works.

The plaintiff claimed loss of crops by water flooding small areas of his land, the loss of personal property and damage to improvements on his land. He claimed that the placing of these dams, dikes, structures and obstructions in the Big Blue River and diverting Bayou Creek into Big Blue River had caused him a loss of \$100,000 on his farm. He asked for an injunction requiring Hughes Bros., Inc., to remove the flood control works, since the latter had contributed largely to the cost of their erection and had been the greatest beneficiary of the works.

It so happened that the City had instituted condemnation proceedings, before entering on the project, for



the very purpose of acquiring the right to flood plaintiff's land, and had deposited the amount of the award in the custody of the court which heard the condemnation proceeding. The plaintiff was very dissatisfied with the award, however, and chose to bring the injunction action against the private defendant, Hughes Bros., Inc., apparently in a roundabout effort to put pressure on the City.

The court held, however, that the plaintiff had already been compensated for the losses by means of the condemnation award, and that the condemnation proceeding had been valid. The mere fact that a private individual was greatly benefited by the flood control project did not prevent it from being a public project. Thus, the City's exercise of its eminent domain power was proper, and was binding on the plaintiff. As a result, he could not get any further relief from the City, whether by way of damages or an injunction. And as to his action against Hughes Bros., Inc., the court held that the mere fact that a private individual receives benefits from a public project, contributes to its cost, and assisted in securing the project for the City, does not mean that he is personally liable for the results.

As a result, the plaintiff got nothing except more floods—and Hughes Bros., Inc., succeeded in keeping the river away from its door.

Only Nature Can Make a Tree Fall Down

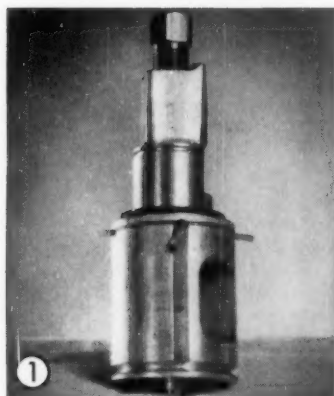
In *The Standard Fire Insurance Co. v. City of Fremont*, 131 N.E. (2d) 221, an Ohio case decided Dec. 14, 1955, a house was damaged by the falling of a tree on it.

Prior to April 1, 1950, there stood in front of the Smith premises between the sidewalk and the street proper a large elm tree. Several months earlier, the City of Fremont undertook the project of widening and paving Jackson Street in front of the Smith property through an independent contractor. The con-

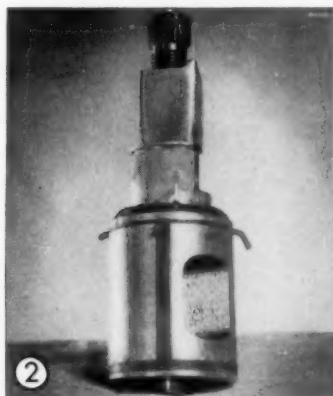
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PRESSURIZED LUBRICATION

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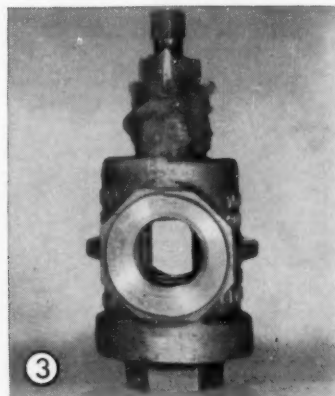
HOMESTEAD *lubricated* PLUG VALVES



This plug was removed from a Homestead Valve just after starting lubrication, and before all sealing areas were filled with lubricant. Note that pressurized lubricant continues to extrude through feeder holes. Momentary downward movement of plug at start of each lubrication, gives assurance that plug is always free to turn.



The plug was again withdrawn from the valve body just after a ring of lubricant around the stem indicated that the lubricant system was full. Note that all lubricant grooves are filled. The entire plug surface is coated with lubricant. Lubricant is well packed in the stem sealing area above the plug.



Now valve has been purposely over-lubricated as indicated by excess lubricant around stem. Note that with *controlled* pressurized lubrication there is no extrusion or seepage of lubricant into valve port opening. This means no waste, no contamination of line fluids, no clogging of low pressure lines with lubricant, or fouling of meters, orifices, etc.



Also, in the Homestead Valve with *controlled* lubrication, you will note that even though the valve has been over-lubricated, lubricant comes only to the bottom edge of the plug, and is not wasted by discharging in quantity into the bottom chamber.



Now, see for yourself the risk involved when a valve which does *not* have Homestead's *controlled* Pressurized Lubrication, is over-lubricated. Note lubricant has been forced into the port opening. It can contaminate line fluids, foul meters or orifices, or even block low pressure lines!

* Unretouched photos.

These are but a few of the many advantages of Homestead's controlled pressurized lubrication that guarantee lowest cost valve service.

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tractor, in carrying out the work as planned by the City, cut off some of the roots of the tree in question on the side next to the curb line of the street in order to insert curbing. This cutting weakened the stability of the tree. During the winter months following, the tree began to lean away from the street toward Smith's house. An officer of the City of Fremont was notified of the condition and ordered the tree removed. However, before its removal, it fell on the Smith house and damaged it to the extent of \$2200. Smith's insurance company paid for the repairs and brought suit against the City.

The Insurance company's theory was that the cause of the damage was the City's negligent acts in the construction and maintenance of a public street.

The Court held, however, that the duty to remove the tree was based on the City's common law duty to perform its governmental functions, rather than on its statutory duty to keep the streets in repair. The statute which holds a City liable for negligence in maintenance of public streets relates only to injuries caused by defective conditions in the street itself, which injuries arise out of public travel in the street. That was not the case here.

Therefore, the only duty of the City was based on common law, rather than on the statute. But since this was a governmental function, rather than a private or proprietary function, the City's immunity from suit protected it. As a result, the Insurance Company was able to recover nothing from the City.

• • •

Water Consumption Ever on the Increase

The following data were abstracted from the Annual Report of the Department of Water Supply, City of Detroit. This report covered the fiscal year to June 30, 1955. The average daily pumpage of water from the water plants was 457,544,900 gals. The maximum day pumpage occurred on July 27, 1954 and was 695,800,000 gals. The maximum hourly pumpage occurred on July 26, 1954 and was 39,580,000 gals. The average per capita consumption per day was 162 gals. The maximum hourly pumpage was at a rate of 949,900,000 gals. a day or at a per capita per day rate of 336 gals.

★ ★ ★ ★ ★
20th
 ★ ★ ★ ★ ★
ANNIVERSARY
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*South Carolina Rte. 41
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*A new soil-cement road in
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SOIL-CEMENT

Twenty years ago engineers built America's first scientifically-controlled soil-cement road in South Carolina. This low-cost road today carries much greater traffic yet requires only routine maintenance.

One of the newest soil-cement projects is the California highway at the left. In 20 years soil-cement paving has spread from coast to coast and proved itself under all climatic conditions. Today there are more than 10,000 miles of soil-cement roads delivering dependable, all-weather service.

This 20-year record of service has amply proved the value of soil-cement—the economical pavement made from local materials mixed with portland cement and water. About 85% of the required material usually is soil already on the site. Only cement and water must be hauled to the job.

For more information about soil-cement paving for low-cost roads, streets, and airports, write for free literature. It is distributed only in the United States and Canada.

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Look what's new in Cleveland! A great white way of fluorescent light by Westinghouse 4FSL-72 street lighting luminaires. The change from the old system to the new was made in record time because Westinghouse units are designed for quick installation and simple maintenance. The importance of these advantages can be measured in real savings—savings in labor cost during installation and for the maintenance life of your street lighting system.

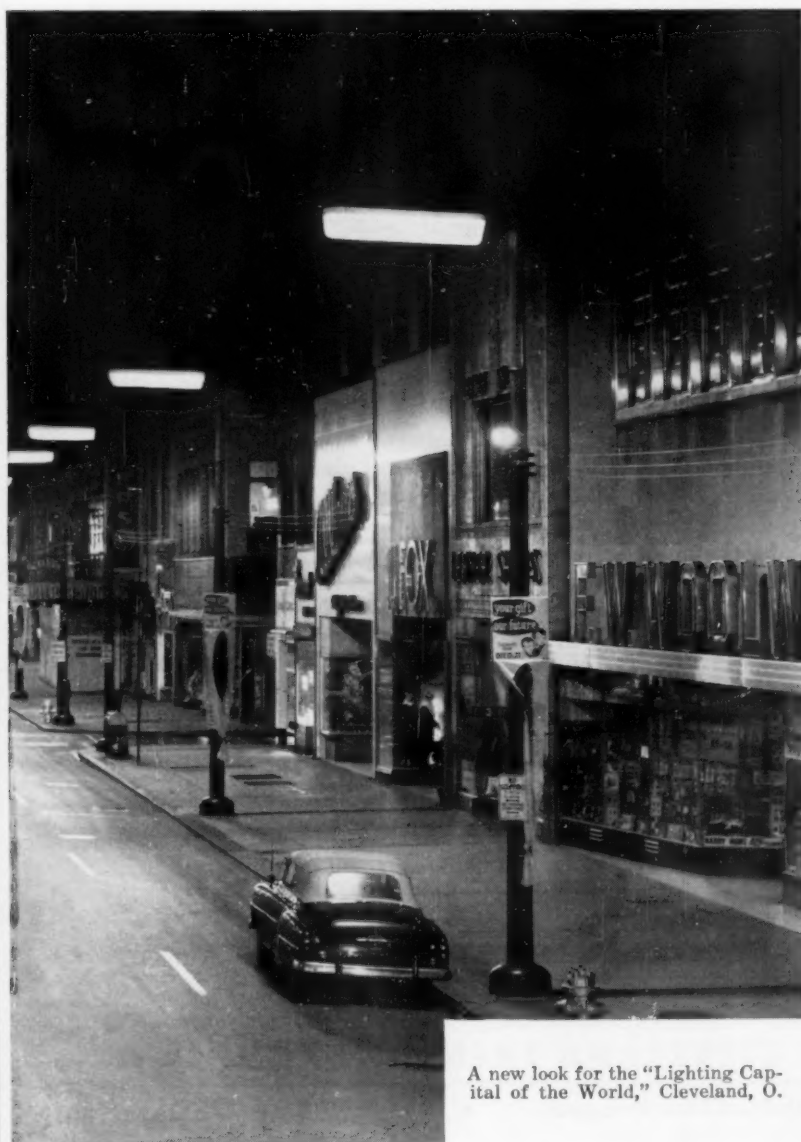
If you are planning a fluorescent street lighting program, examine these important features, and you will agree that the Westinghouse 4FSL-72 fluorescent luminaire is built for a lifetime of efficient, economical operation.

More information? See your nearby Westinghouse representative, or write Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio.

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Attaching luminaire to pole . . . is done by tightening four bolts on the heavy-duty mounting bracket. 4FSL-72 may be mounted horizontally or at a 15°-30° angle for wider light distribution.



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Closing luminaire after installation . . . cover may be opened or closed from either side by releasing three pressure latches. Cover is clear acrylic plastic which will not discolor with age. Fiber glass housing *never* requires painting.



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SO SAYS HUBERT S. ELEY, vice president and general superintendent of D. A. Foster Trenching Corp., of Merrifield, Va. Today the firm, employing about 200 men in the field, keeps its 10 Cleverlands (Models 95, 110 and 140), constantly busy on trenching jobs of all kinds. Further excerpts from Mr. Eley's report:

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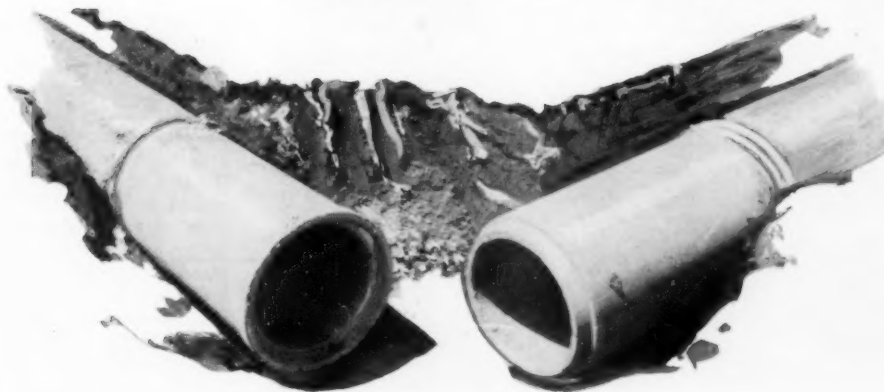
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THE FRONT-FOOT BENEFIT CHARGE



● **STORM DRAINAGE** is needed in built-up areas to prevent property damage, but few property owners can afford to pay the cost for big pipe like these.

DURING the last few years a steadily increasing pressure has been placed on the Montgomery County (Md.) Council to revise that part of the Road Code which relates to front-foot benefit charges. The Road Code calls for the full cost of new street, sidewalk and storm drainage construction to be borne on a front-footage basis by the owners of property which abuts the improvement. The only restriction on this provision is the requirement that the amount of the assessment shall not exceed the value of the improvement to the property.

However, as a practical matter, County authorities are not concerned about the special assessment charges which fall far short of exceeding this limitation. It is simply the higher-than-normal charges which give County officials their headaches. In this respect the County has many a municipal fellow-sufferer. Conversations with municipal colleagues in the State of Ohio have convinced me that there is a great correlation between high street assessments and high blood pressure in municipal officialdom. Certainly there are few pursuits more thankless than that of assessing storm sewer costs.

Because the problem is in rather acute form in growing Montgomery County, my remarks shall refer to that area in specific; but the gen-

JEPHTHA J. CARRELL

City Manager, Xenia, Ohio

eral discussion is applicable in hundreds of cities and counties.

The average front-foot benefit project in Montgomery County consists of street construction to a width of 26 feet, curb and gutter, sidewalk construction and the installation of a nominal amount of storm drainage. The assessable cost per front foot for this "normal" case runs to about twelve or fifteen dollars. Let us take the case, now, where the need for heavy grading, major storm drains, etc., runs the cost up to about \$35 per assessable foot along residential property. What are the alternatives open to the council?

1. The whole project can, of course, be dropped, in which case there would be no charge. This is frequently done, especially when the abutting owners oppose the project. This alternative does not, of course, meet the problem at all.

2. The full cost of the project can be assessed without submitting to the protests of those affected. This comes no closer to a solution of the problem than does alternative 1. A heavy assessment is made no less burdensome by the fact that it is legally levied and is done in the public interest.

3. Through revision of the county Road Code, all costs could be borne by the general taxpayer. It would

be difficult to justify an expenditure from general tax monies which affected only a part of one subdivision. To take an extreme case, construction of a one-block stretch of street which did not serve through-traffic could hardly be called a project in the public interest. The same argument applies with similar, if less weight to nearly all of the street projects in sprawling 526-square-mile Montgomery County.

4. A completely different method of assessing costs could be employed. For example, instead of assessing on a front-foot basis, a square-foot basis could be used. Or nearby properties which did not abut the improvement might be assessed at a rate which would vary inversely with the distance of the property from the construction. The desirability of a completely different method of assessment can be debated endlessly. However, the leading arguments in favor of the present front-foot system are formidable, making it unlikely that such a change will issue. The present system provides a simple, clear, reasonably equitable method of distributing costs. There is not space here to cite the opposing arguments in detail, but one could stand on the position that the greater equit-

Photographs by Fred Weisbrod, City Manager, Oberlin, Ohio, formerly Administrative Assistant to Director of Public Works, Montgomery Co., Md.

**PUBLIC WORKS
MAGAZINE**
Volume 87, Number 7



● **DEVELOPMENT** along a road like this soon results in requests for curb and gutter, sidewalks, adequate drainage and better streets; and someone has to pay.

ability of other methods is questionable, and that the advantage of simplicity and clarity offered by the front-foot method is considerable.

5. The present system could be followed with the exception that the general taxpayer would assume the costs of installing storm drainage. Because heavy or difficult storm drainage construction accounts in almost every case for exceptionally high assessment charges, this proposal has a good deal of merit. By eliminating storm drainage construction from the assessable costs, unusual burdens on abutting owners would be virtually at an end. While there is some justification in spreading the costs of installing large-diameter storm drains, one might legitimately raise the question as to whether the general taxpayer properly should bear these costs. Of course, these might be assessed against the (surveyed) drainage area rather than against the general taxpayer, but the costs of such a system would be difficult to justify. There are a number of subalternatives on this point. For example, some communities assess against the abutting properties only those storm drains which are less than a certain specified diameter.

6. A flat figure per assessable foot could be set for each type of improvement: street construction "X" dollars per assessable foot, storm sewers "Y" dollars per assessable foot, etc. This suggestion has much to commend it. There would never be any doubt in the mind of the abutting property owner about the cost of the improvement. Unfore-

seen difficulties or changes in the cost of materials would not change the estimated cost per assessable foot, an estimate now provided for the owner to enable him to determine whether he is for or against the improvement.

The considerable time and expense of drawing up assessment ordinances setting the charges for completed projects could be saved. In Montgomery County the preparation of such an ordinance for the "average" project requires approximately three weeks of work by an experienced engineer, and engineers are scarce commodities at the salaries municipalities are paying. If

there were initiated no more than twenty projects the expenditure of engineering time would equal more than one man-year.

Standard charges do, of course, have their drawbacks. The standard would be determined, presumably, by using the average cost of a particular improvement, based on the experience of the previous year or two. In the case of those projects in which the actual cost of the improvement far exceeded the standard there would be no objection to the flat figure. It takes little imagination, however, to picture the protests of assessed parties where the actual costs ran well below the standard charge! In fact this raises a legal "gimmick" which weakens an otherwise sound procedure. If the charge is greater than the cost of the project, then the flat figure would not be legal, even though the benefit were greater than the charge. If the flat figure were set low enough to apply safely in all cases, then this system would merely be a variant of alternative 3 above.

7. The cost of the improvement could be assessed up to a maximum charge per assessable foot, with the general taxpayer bearing the remaining expense. This is a practical, down-to-earth compromise between the spirit of the present Road Code and the unwillingness of the property owner to pay heavy charges. It is at once a recognition of the merits of front-foot benefit assessments as a means of meeting construction costs, and of the inequity of some excessively heavy charges. The general taxpayer would foot



● **COSTLY AS** good drainage facilities may be, lack of them can become vastly more expensive. Here is a sample of what can happen when storm drains are inadequate.

the bill for costs above a certain amount, but this is consistent with one of the fundamental tenets of democracy, that the majority should lean over backward to be fair to minorities.

8. Road improvement districts could be created. The pros and cons of this approach have been debated for years in connection with all types of civic improvements. In Montgomery County the growth in population is so rapid and so well distributed for the most part, that the logical boundaries for such a

district or districts would include over half of the county. This is an entirely feasible approach, but one which might well be avoided for reasons of principle. The multiplication of governmental units increases the complexity of government and provides somewhat dubious advantages in achieving equitable sharing of costs.

For Montgomery County it seems that the best choice, in the event of a change in the present system, lies either in the maximum charge, or in the general taxpayer assum-

ing the costs of installing storm drainage. The decision will be of great importance to the county and its citizens for Montgomery County is continuing the rapid growth which changed it from a population of 168,000 in 1950 to an estimated 250,000 at present, and caused the construction of over 33 miles of roads in 1952 alone. Streets must be constructed. As in many other communities, the manner in which the construction is paid for will have a profound effect on individual property owners and the public purse.

High and Low Rate Filters **PROVIDE EXCELLENT EFFLUENT**

LESTER LEE, President, Hitchcock & Estabrook, Consulting Engineers

TO SERVE a population of about 5,000 and to provide treatment also for industrial wastes that bring the total population equivalent to 10,500, Wadena, Minn., has constructed a modern sewage treatment plant, utilizing both high rate and low rate filters to produce an effluent of about 20 ppm BOD.

This is a progressive community as may be noted from the fact that it constructed a sewage treatment plant in 1925.

This original plant consisted of a wet well, sewage pumps, Imhoff

tank, trickling filter, final clarifier, and sludge drying beds. As the community grew, the treatment plant became overloaded and in the spring of 1946 a report together with recommendations for improvements was made to the Council. The Council began setting aside funds for these improvements so that, over a period of years, cash would be available for a modern treatment plant.

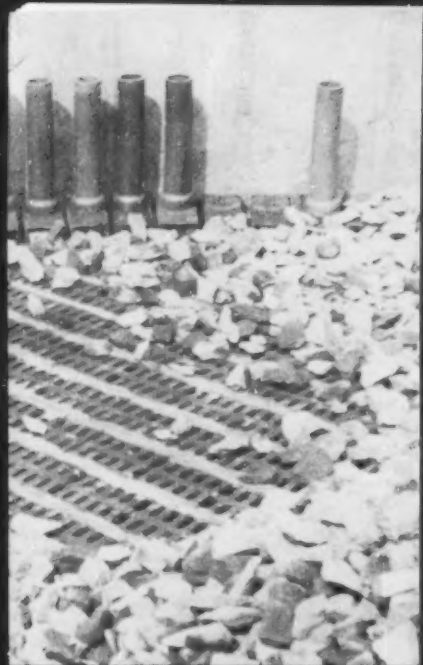
In the meantime the members of the Council spent a considerable amount of time in study of treatment processes and visited quite a

number of treatment plants. Hence, when the time came to proceed with detailed plans, they were in position to make intelligent decisions as to policy in connection with the design of the project. The decision was made in 1954 to proceed with plans and specifications for a modern bio-filter plant, using the old trickling filter as a finishing filter, and the old Imhoff tank as a secondary digester. Subsequently, plans were completed and approved by The State Department of Health. Bids were taken and the project was placed under contract in the spring of 1955.

Raw sewage enters the new plant



● HANDLING both domestic sewage and industrial waste, this modern treatment plant produces an effluent of about 20 ppm.



● FILTER block underdrains were installed to insure best results.

through a comminutor and mechanically cleaned grit chamber, and flows thence by gravity to a wet well. It is then pumped to a circular clarifier, 40 ft. in diameter with 7-ft. swd where 1 2/3 hours detention is provided for the design flow of 630 gpm. There are three non-clog raw sewage pumps; two have a capacity of 900 gpm. each and the third a capacity of 300 gpm. The automatic controls are so set that the 900 gpm. pumps operate alternately; and in case the total flow, including continuous sludge removal from the intermediate clarifier, exceeds 900 gpm., the 300 gpm. pump starts. In case the flow exceeds 1200 gpm., an overflow line has been provided to by-pass the plant with the excess flow. Sewage flows by gravity from the primary clarifier to a high rate filter, 58 feet in diameter and thence into an intermediate clarifier 40 feet in diameter.

Sludge is removed from the intermediate clarifier, continuously through a float controlled valve, into wet well No. 1 at an average rate of about 245 gpm. During extreme flows this valve will close entirely, but flows in excess of 1200 gpm. are not expected to occur for some period of years and then for very short periods only. This valve is adjustable in order to control the flow and as the flow of raw sewage increases, the valve closes, thereby reducing the pumping load. At such time as raw sewage flows increase greatly, the increase is due largely to ground water infiltration and the strength of the sewage is re-

duced. Due to this reduction in sewage strength, the amount of recirculation needed for proper treatment is proportionally reduced.

The effluent from the intermediate clarifier flows into wet well No. 2 and a portion is pumped from there to the old standard rate filter at the rate of 630 gpm., while another portion is pumped to a head box ahead of the high rate filter. Two recirculation pumps are provided, each having a capacity of 265 gpm., and one of these pumps is in operation at all times. The second pump is provided for alternate service and both are manually controlled. A third pump has been provided to take care of overloads and for standby service. These three pumps are equipped with float controls and automatic alternators, so installed that only two pumps will operate at any given time. In case two pumps cannot handle the load, an overflow from the wet well has been provided to handle the excess.

Sewage flows by gravity from the finishing filter to a final clarifier and then to a chlorine contact tank for 20-minute detention; thence it is discharged through a tile line to a small stream. Sludge is removed continuously from the final clarifier, by gravity to wet well No. 1 at the rate of about 10 to 15 gpm. Flow is controlled manually, by a gate valve near the clarifier which permits periodic flushing of the line.

The new fixed cover digester is 40 feet in diameter and is designed for about four cubic feet per capita. It is banked with earth fill and the roof has two inches of rigid insulation. A separate digester control building, adjacent to the digester, houses the two sludge pumps and the heating equipment. Two boilers were installed, one of which is equipped with a burner to utilize the sewage gas and the other with an oil burner for emergency service.

Sludge in the digester is heated by a separate heat exchanger, located in the digester control building. A small pump, with thermostatic control, pumps the sludge through the heat exchanger, providing additional mixing of the liquid in the digester to aid the digestion process. Temperature of the digester is thermostatically controlled at 90° F. Overflow from the digester goes by gravity to a large holding tank or secondary digester. This structure is the old Imhoff tank which was found to be in sound condition. The superstructure and baffles were removed and a flat slab was placed over the top together with a gas collection chamber. A copper dam

was installed in the concrete, to make the installation gas-tight. Gas is piped to the new digester where it enters the gas utilization equipment.

Sludge from the holding tank flows by gravity to a tank truck and is hauled away for fertilizer. The idea of using digested sludge without de-watering is fairly new and appears to be an excellent method of disposal at minimum cost. The sludge at Wadena is being used almost entirely on the municipal airport but we understand that a number of farmers are anxious to obtain the material. The old sludge drying beds are in good condition and may be used if necessary.

The pumphouse for the old plant was very small and is now being used to house the chlorination equipment. Facilities have been provided to permit the application of chlorine in wet well No. 1, as well as in the chlorination contact tank. It is expected that about 10 ppm. will be required.

The new main control building is equipped with laboratory, garage, shower room and toilet facilities. All electrical equipment is controlled from a central panel located in this building. Red indicator lights on the panel show at a glance exactly which pieces of equipment are in operation.

The plant is located quite a distance from the public water system; hence a four inch well was drilled to provide an adequate water supply at the plant. This resulted in a substantial saving of money as compared to the cost of bringing in water-main extensions. A submersible type pump was used and the pressure tank is in the main control building. In order to prevent any possible contamination of the potable water system, a separate pressure system was also installed to service hose lines and the chlorinator. Pressure tanks each have a capacity of 50 gallons.

The main control building is heated with hot-water unit heaters which are supplied with hot water from the boilers in the digester building. All heating lines are installed underground and are insulated. Thermostatic controls, with hot-water circulating pumps were provided.

All work was performed by general contract by Barbarossa & Sons, Inc. of St. Cloud, Minnesota. The total contract price was \$240,800. Work was started in May and completed in October, 1955.

The major items salvaged from the old plant are the standard rate trickling filter, which is completely

housed and the old Imhoff tank which is being utilized as a secondary digester. This filter is 70 feet x 86 feet with 9 feet of filter media. The Imhoff tank is 42 feet x 20 feet with 20-ft. sidewater depth.

Equipment for the digester, including gas collection equipment, and for all three clarifiers, was furnished by Dorr-Oliver. The new sludge pump was furnished by Carter and the old sludge pump was re-installed for standby service. Piping is so arranged that the operator may use either pump. The old pump is in good condition and should give years of service for standby use.

Grit removal equipment was furnished by Chain Belt Company. Washed grit will be used for fill around the plant site. Raw sewage pumps are non-clog type and were furnished by Fairbanks-Morse; and

the controls by Healy-Ruff Company. Electrical Control Panel was furnished by Square "D" Company and electrical work was by Komula Electric Company of Wadena.

Parshall flume for measuring the raw sewage flow was furnished by Thompson Manufacturing Company of Denver. It is of sheet metal grouted in concrete. At such time as the sheet metal corrodes, it will be removed, leaving the concrete flume in place. The flow recorder was furnished by Brown Instrument Division of Minneapolis-Honeywell Corporation and the comminutor by Chicago Pump Company.

Both water systems were furnished by Fairbanks-Morse. These provide for 15 gallons per minute in each of the two systems, with automatic pressure switches on each tank. Tanks are of adequate size to pre-

vent undue starting and stopping of the pumps.

In case of a power failure, sewage will overflow at a manhole, ahead of the plant, through a by-pass line, thereby avoiding any possibility of flooding the plant.

The plant is designed to provide an effluent of about 20 ppm BOD with 98% removal of settleable solids.

The plant is operating very efficiently and even in this climate with temperatures to 30 below zero, there has been little or no trouble with ice, even though all of the clarifiers and the filter were constructed without roofs, permitting a substantial saving in construction costs and a further saving in maintenance costs.

Fencing and seeding will be completed this spring by the regular village employees and are not included in the contract price.

DIESEL DRIVEN PUMPS

Reduce Operating Costs

SOON AFTER THE end of World War II, the 54-year old water supply system of Greensboro, N. C., began to show signs of lagging behind the demands of an increased population and industry. Population inside the city increased from 63,000 in 1944 to 81,000 in 1954, and the suburban growth was even more impressive. In two steps, the first taken in 1948 and the second in 1953, the system's five outmoded steam turbine-driven pumps, installed at two pumping stations, were replaced with four Fairbanks-Morse diesel driven units, thereby increasing the capacity of the two pumping stations by 26.5 mgd. and 29 mgd. Between 1947 and 1955, 60 miles of new mains and distribution lines, ranging in size from 6-in. to 30-in., were laid and a new 1½ mg. capacity elevated tank was constructed to raise and stabilize pressures throughout the system.

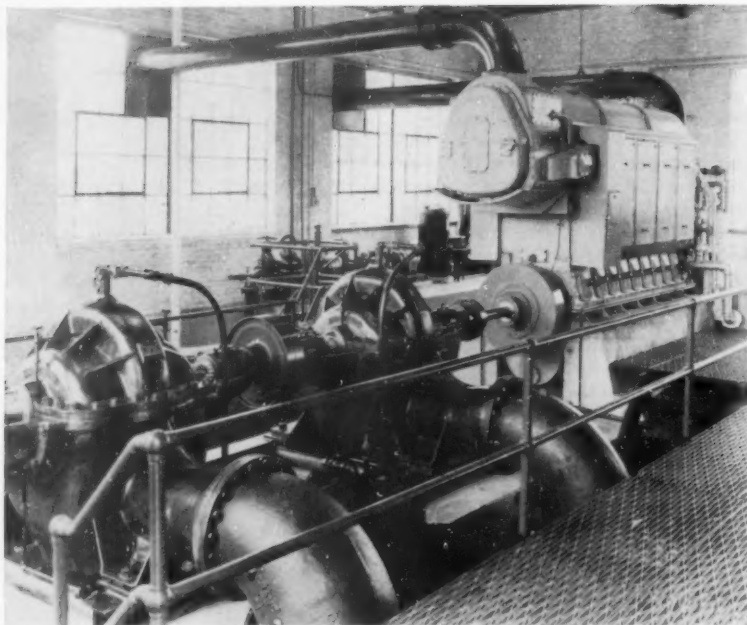
To date, the city's water department has spent almost \$2,500,000 in expanding facilities; about \$2,000,000

has gone into the distribution system and \$500,000 into the supply system. Before the current program is completed, an additional \$2,750,000 is expected to be spent to expand the filtration plant to a capacity of 20 mgd.; complete a new raw water line from the reservoir to the filtration plant; add new mains into outlying districts; and provide additional raw water supply and elevated storage. Between 1940 and 1947, when the program first got underway, the average demand for water in Greensboro jumped from 5.3 mgd. to 7.9 mgd., with peaks exceeding 10 mgd. This placed a heavy load on the system, particularly on the five steam-driven pumps which had been in service for from 20 to 26 years. The city's 800-million-gallon reservoir, meanwhile, could supply only 11.5 mgd. during dry spells and the filtration plant was limited in capacity to 12 mgd.

The installation of four new diesel-driven pumps, ranging in capacity from 11.5 mgd. to 20 mgd., improved

the situation, but bottlenecks still existed at the reservoir and the filtration plant. The demand last year reached an average of 10.2 mgd. and for the first time peaks exceeded 13 mgd. For periods of several days in 1953 and 1954 the demand actually surpassed the output of the system's filtration plant and the city had to call upon its pure-water storage to see it through. Even this, however, was not enough during the long drought of the late summer and early fall in 1954 when virtually no rain fell for two months and the city had to resort to rationing in order to preserve essential services. The 6½ inches of rain which accompanied Hurricane Hazel filled the reservoir and restored normal service—but the city was still faced with an average demand that was only 1.8 mgd. below the peak capacity of its filtration plant and 1.3 mgd. below the dry-spell capacity of its only reservoir.

Since the installation of the new pumps at the Reedy Fork pumping station, which draws raw water from



● DIESEL driven pumping unit shown here is latest to be installed. The 1280-hp unit, one of four, drives two 20-inch centrifugals. Capacity is 20 mgd at 305 ft.

the reservoir and sends it to the filtration plant; and at the City pumping station, which draws filtered water from storage and sends it through the distribution system, over-all operating costs at both stations have been reduced by an average of 55.7 percent. This includes the costs of fuel, maintenance and labor, and in the fiscal year 1953-1954 amounted to a gross saving of \$46,372. Since the water supply system is operated under the city's Public Service Department on a self-sustaining basis, all revenues over and above operating costs are transferred to the system's construction fund. As a result, the money already saved by the new diesel equipment, as well as all subsequent savings, will be used to help pay for future expansions. This will aid local water consumers directly by lightening the cost of water burden and will also aid them indirectly by supplying the additional water capacity needed to continue the current city growth trend. Additional dividends include a substantial capital investment saving, made possible by installing compact diesel-driven equipment and the restraining effect an increased water supply will have on local fire insurance rates.

The first of the four new diesel-driven pumps installed was a 16-in. F-M single-stage, double-suction, split-case, horizontal, centrifugal pump driven by a 450-hp., 6-cylinder diesel engine. This new medium-head high-capacity unit was placed in op-

eration at the Reedy Fork station and increased the rating of the station from less than 15 mgd. to 20 mgd. Rated at 12 mgd. at a TDH of 156 ft. the new pump replaced a pair of 27-year old 6-mgd. horizontal pumps, series connected and driven by a single low-pressure turbine. From the day it went into operation, the new unit has been operated at constant speed and delivery and has been assigned as the station's base load unit. As a standby, the department retained the second of the two

steam-driven units installed at Reedy Fork, rated at 9 mgd and originally acquired in 1926. This unit has not been used.

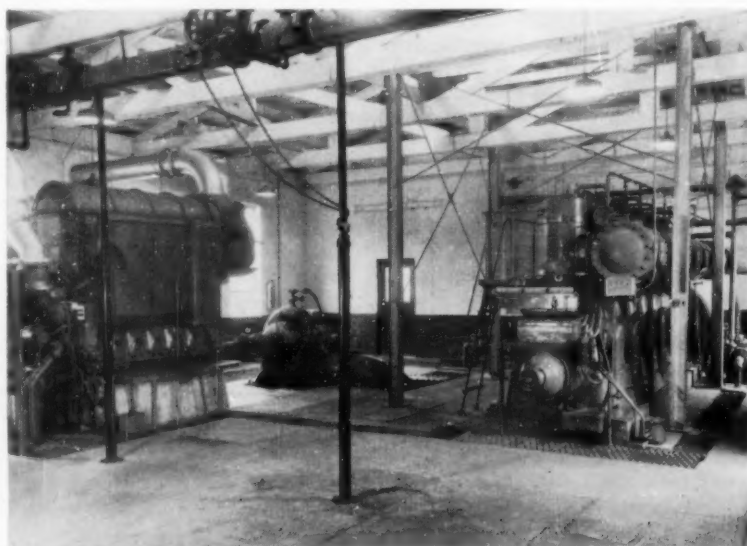
The second of the new diesel-driven pumping units, installed at the City Station, consists of a pair of 14-in. single-stage, double-suction, split-case, horizontal, centrifugal pumps series-connected and driven by an 805 hp., 300 rpm., 7-cylinder diesel engine. This addition permitted the department to retire three 9-mgd. steam-turbine-driven pumps to standby duty. The City Station pumping unit, rated at 11.5 mgd. at a TDH of 305 ft., is driven through a speed-increasing gear of 3.92:1 ratio at variable speeds up to 1176 rpm.

The third of the new diesel-driven units is a 20-in., single-stage, double-suction unit driven directly through a flexible coupling by a 640-hp., 720 rpm., 4-cylinder, F.M. opposed-piston diesel engine. Rated at 17 mgd. at a discharge head of 156 ft., it brought the capacity of the Reedy Fork station up to 38 mgd., including the 9 mgd. standby pump.

The fourth pumping unit consists of two series-connected 20-in., centrifugal pumps driven directly through flexible couplings by a 1280-hp., 720 rpm., opposed-piston diesel. It is rated at 20 mgd. at a TDH of 305 ft.

Together these two diesel pumps have increased the City station's capacity to 53.5 mgd. including the 27 mgd. standby.

W. M. Lybrook is the Director of Public Service and N. L. Mitchell is the Superintendent of Pumping Stations at Greensboro, N. C.



● REEDY Fork pumping station, interior view. Unit at left, 640-hp., is rated at 17 mgd. Engine at right drives pumps with capacity of 12 mgd. Both operate at 156-ft.



PARKING LOT

A NEW MUNICIPAL parking area, built at a total cost of \$4,188,750, including \$1,165,000 for land acquisition, was recently opened in Jacksonville, Florida. It fronts on the St. Johns River, adjacent to the central business area, straddling the north approach to the Main Street bridge, over which flows a large volume of local traffic plus tourist traffic from several arterial highways. The area is rectangular in shape, about 400 ft. north-south and 1600 ft. east-west, or about two blocks in each direction from the bridge. It is built to accommodate 1,184 automobiles, but it serves a dual purpose as it beautifies a waterfront area that had become an eyesore.

Financing of the parking facility was achieved by issuance of \$4,000,000 in 30-year revenue certificates; the remainder of the cost was provided out of available funds. The bonds are backed by receipts from parking, plus receipts from parking meters elsewhere in the city as long as may be necessary. The City Commission estimates it may be three or four years before the parking facility alone will produce enough revenue for debt service and maintenance. Traffic consultants estimated prior to construction that parking fees in the first year would total \$182,500. One section of the facility with 675 stalls was opened in December, but the remainder was not opened until March. The new lot has greatly relieved a serious shortage of off-street parking in Jacksonville.

In constructing the facility the City of Jacksonville acquired 17½ acres of new municipal property. Most of the area lay under water in the St. Johns River beyond the existing shore line, which was 400 ft. from the pierhead and bulkhead line established by U.S. Army En-

Beautifies the City

C. E. WRIGHT

gineers. A sand fill dredged from the bottom of the river near the center channel was dumped from hopper-bottom scows on the underwater portion of the site, replacing a soft muck and silt that had to be removed to insure a stable foundation for the parking area. The muck and silt covered the bottom to depths of 2 to 15 ft.

Around the entire area a concrete capped sheet steel piling bulkhead was constructed including returns to high ground on the east and west ends of the site. A conventional sheet steel piling bulkhead wall with steel wales, tie rods and steel tie-backs was used. The area was crowned to permit runoff. A flexible type paving was put down

first to minimize maintenance due to fill subsidence after construction, but subsidence was virtually nil so a permanent type paving was laid over the flexible paving before the facility was turned over to the city.

Parsons, Brinckerhoff, Hall & Macdonald of New York were traffic and layout consultants for the city's fiscal agents, Pierce, Carrison & Wulbern, Jacksonville. Reynolds, Smith & Hills of Jacksonville were the designing and supervising engineers and were represented on the job by C. L. Lash as project engineer. The Duval Engineering & Contracting Co., Jacksonville, did the work.

Parking fees being charged are 25 cents for the first hour plus five cents an hour for each additional hour up to a maximum of 75 cents. The monthly fee is \$10.



● MUNICIPAL PARKING AREA in Jacksonville, Florida, provides space for 1,184 cars and relieves a serious shortage of off-street parking space in the central business area. Much of the 15-acre lot was built on fill within the bulkhead line.

ALLEY IMPROVEMENTS

FRED M. SEGUIN

THE IMPROVEMENT of alleys with concrete pavement can be as exacting as any paving project from a planning and supervision standpoint. Let's take a look at some of the complications, pitfalls, and troubles encountered by the men charged with the responsibility of getting the job done right.

In general there are two types of alleys. One is the straight-through alley—from one street to another. The other is the "T" type alley, having two thoroughways joining each other at approximately 90°, within the block. A variation of the "T" alley is the "H" alley which presents complications similar to those of the "T" type.

In most communities the cross section of alley pavements is typified by an inverted crown. This design is dictated by the fact that ditches are impractical and undesirable along alleyways. The drainage is carried in the center of the pavement rather than along the edge. This factor, in combination with small differentials in elevations, the desirability of meeting existing garage and entrance grades; and then, in the case of "T" alleys, synchronizing two sets of grades, is what makes alley design difficult.

Taking the processes of getting the job done in their usual sequence, we will start with the field work which proceeds essentially according to the following outline:

1. Pre-survey preparation: Examination of all existing records of the area and notation of pertinent features.

2. Field survey: a. Running in the centerlines; b. topographical sketches; c. cross sections; and d. special notations.

To elaborate on the above outline let's see what is typical of alley paving surveys and what features are usually involved.

A thorough examination of the records for the evidence and location of manholes, catch basins, culverts, sewers, water and gas lines, etc., and proper notations thereof, before starting the survey, will assure getting all the necessary information the first time out. If this

is not done prior to the field work, it is invariably found necessary to return later for additional data. It is very common to find manholes and culvert entrances completely buried and without the records they would be missed entirely during the field survey.

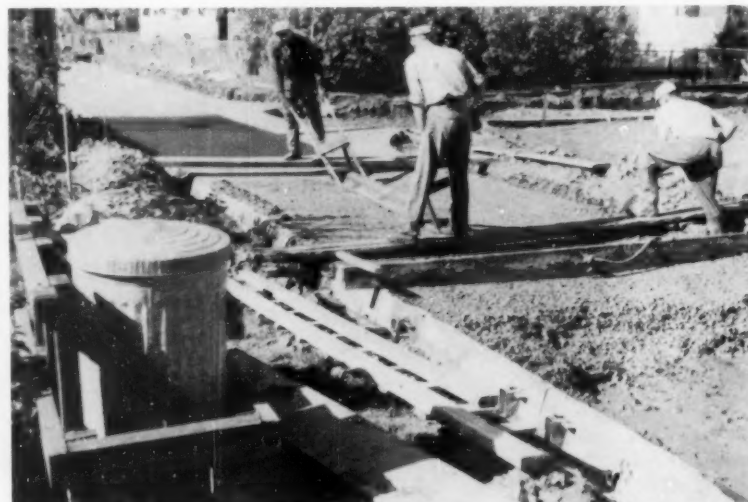
On the site, the centerlines are run in and permanent end points set beyond the limits of the work so that

the alignment can be re-established quickly during construction. These are usually hubs, or crosses chiselled in concrete. At this time, also, buried manholes, culverts, catch basins, etc., are uncovered so they can be picked up when topography is noted.

Next the topographical features are sketched on the field notes. At this time notes are made of the spe-



● INSPECTOR supervises the checking of the fine grading with a template. This procedure is one of the necessary steps if a first-class job is to be obtained.



● LONGITUDINAL bull float aids in getting a uniform surface and in preventing small water pockets in the surface of the alley paving after it has been cured.

NEED ENGINEERING

cial conditions that require elevations when the cross sections are taken. These may include garage entrances, ramps, abutting sidewalks, tops of adjacent building foundations and window sills, culvert entrances, manhole and catch basin covers and entrances.

Cross sections are then taken at a maximum of 50-foot intervals, with additional sections at breaks in

grade. Also full sections should be taken at centerlines and gutter lines of abutting streets, at cross walks, etc. Elevations of the special features noted above are also taken as the work progresses.

It should be emphasized at this time that elevations are the most critical requirement of survey work for alley improvements. Level shots should definitely be read to one

hundredth of a foot as it is occasionally found that the division of one tenth of a foot is all there is available in working out a grade. The quality of the levelling work must be of the highest throughout as often the whole plan must be synchronized against very small differentials in elevation. In fact getting a workable grade where it doesn't seem to be available is the most exacting part of designing alley pavements.

On The Board

Alley pavements definitely rate formal plans—and not only because of letting requirements. There are far too many complexities in relation to contrasting grade demands, especially in the "T" type alley, and far too many taxpayers involved, to take a chance with on-the-spot designing. In other words these jobs are "loaded" with delicate balances that can be determined only by careful study.

About the first decision to be made is the slab design and subgrade treatment to be used. An investigation of standard sections used by several municipalities will turn up about as many designs. They vary from 6 ins. to 9 ins. in thickness, some with uniform depth and others with variations of thickened edges. Width may vary from 10 to 20 ft. Some have construction joints along the centerline and others are made in a single pour from one side to the other.

No effort will be made here to analyze or justify any particular slab or subgrade design. In residential areas a low cost 10-ft. slab may be justified. In business zones a slab spanning from one side of the alley right of way to the other may be dictated. However, I would like to point out some factors that may influence design of the slab.

I am personally in favor of slabs having a thickness on the generous side. The contractor's labor costs are increased very little and the increase in material costs is not great. However, the big reason behind this statement is lack of uniformity in concrete quality. Experience shows that ready-mix plant batching sometimes results in concrete strengths with variations approach-



● CONCRETE with 3-inch slump is readily workable by hand methods. Use of air-entrained cement is recommended. Slabs should have a thickness on the generous side.



● CHECKING the pitch across lateral joints is one of the jobs that requires diligent supervision. There are many ways to get into trouble if no engineer is at hand.

ing one hundred percent. Test cylinders tell an interesting story. The sad part of the story is that the answers come too late to be of any benefit to the job they come from.

It must be remembered that alley paving is municipal work and is handled by small staffs that are intermittently involved in many fields of municipal engineering. Seldom are laboratory set-ups available, and less frequently the personnel to operate them. This usually precludes close control of concrete batching. Whether voluntary control measures diligently observed by the ready-mix industry could be expected to result in more uniform concrete quality I am not in a position to say, although I suspect they would.

For essentially the same reasons I definitely recommend the use of a regular air entrained cement over air-entrainment by the additive method. Without proper inspector control at the batching plant, experience shows that an unacceptable variation in air-entrainment can easily occur when the latter method is used.

To get on with laying grades and otherwise designing the alley pavements, let us take note of the schematic drawings that point out some typical problems and locations requiring special care.

It will be noted on the profile of typical through-alley grades that the centerline grade theoretically can be a straight shot from the high point to the low point. However, it is evident that the form grade, representing the edge of the slab, does not parallel centerline grade at the ends. The reason for this is that the inverted crown has to be warped-in to meet relatively flat surfaces at the end. This can be a source of trouble in design depending on the method of grade computation. If the designer is not sufficiently aware of this problem he may wind up with a flat centerline at the ends.

On the typical cross section of alley pavement slabs it will be noticed that there are two lines, one dotted and one solid, representing the top surface of the concrete. The dotted line represents the theoretical section which is also the final contour when the slab is placed in two pours, with a construction joint on centerline. The dotted line also represents the template of the concrete strike-off board which is used when the slab is placed in one pour with no centerline joint. It should be appreciated that if the template of the strike-off is made to match the typical section shown on the

plans, the final contour of the slab will be as shown by the solid line in the case of the single pour. The reason for this is that the strike-off is moved back and forth and the top surface takes on a shape more nearly matching the solid line. The end effect of this working and settling of the plastic concrete is that the centerline is raised slightly from theoretical grade. On a 14-ft. slab with 2½-in. crown this can easily amount to ½ inch.

When meeting surface drainage openings it is always best to figure on sumping the covers slightly from the surface of the surrounding concrete to assure clean run-off. During the planning stages it isn't necessary to attempt setting definite grades as they can best be determined during construction by placing the strike-off board on the forms at the location of the cover. Usually an elevation differential of about 1 in. is found practical. It must be remembered that near centerline some raise can be expected with a single-pour slab, as pointed out above.

Drainage Requirements

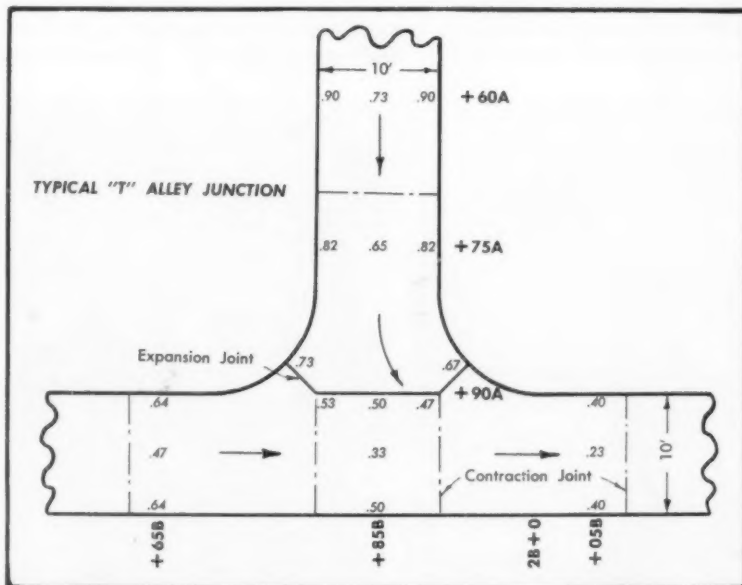
The drawing of a typical "T" alley junction shows what the writer considers to be minimum recommended grades or drainage pitches at such a junction. These are somewhat tricky to figure and warrant some study before the grades are finally set. In general it is desirable to increase the grade of the joining centerline for the last fifteen or twenty

feet if possible. Frequently the slope available to the designer is on the minimum side anyway and because of the difficulties of finishing such a junction all the breaks possible should be given to the finishers.

The job of laying grades is not the simple one of balancing yardage and connecting widely separated points of elevation such as highway engineers encounter. On preliminary examination the notes may show adequate grades available. Then as the plan evolves the designer finds himself plagued by low and high garage entrances and other abutting features that completely upset plans for favorable grades. Then comes the careful balancing of the profile to try to meet all conditions as favorably as possible. After many trials the designer comes up with what seems to him the practical solution. In most cases the result will be a balance of compromises.

The designer should try to keep his centerline grades on the plus side of 0.5 percent. However, this is not always possible. The writer has used grades as low as 0.35 percent with varying degrees of success depending on the ability of the finishers and inspectors. It must be remembered that this water conductor is above the ground for all to see and if one wants a clean looking job it is best not to flirt with sub-minimum grades.

I believe a word about forms is in order at this time. The contractor frequently has to borrow or rent forms from another contractor. Un-



● TYPICAL "T" alley junction using a 10-ft. slab and 2-inch crown. The recommended grades to assure clean flow are shown. The text above gives hints on design.

less these forms are in very good condition it is very difficult to check them accurately for grade. The only way to assure good results on minimum alley grades is to insist on "as good as new" forms.

Sometimes due to a combination of poor grades and slight settlement of the slab as it sets up, small sumps or water traps are formed. These would not be noticed on a street having an upright crown but they show up like a sore thumb on inverted crown alley pavements. These are especially objectionable adjacent to houses with a fresh coat of white paint or where the alley slab warps into a crosswalk. In such places we have found it desirable to break out the old entrance and crosswalk, lowering their grades and carrying the inverted crown right through the crosswalk. This is one way to get out of a tight spot and pick up enough extra pitch to insure clean flow through the paved alley section.

Construction Supervision

Alley paving should have diligent supervision. There are many ways for the job to get into trouble if an inspecting engineer is not on hand at all times to work with the contractor. It is entirely possible that the low bidding contractor has never been on alley paving work before. If not he has a few things to learn and probably the most important is that his finishers have to know their stuff.

We will begin with the staking crew landing on the job. Should they take their level datum from a Geodetic Bench Mark a block away with which the original levels may have been tied in? Experience shows that this can be a source of trouble as it has been observed that the elevation of crosswalks etc. that have to be met can change considerably from one season of the year to another—especially in the Northern Hemisphere. And remember that alley grades do not usually allow for errors in elevations that may amount to as much as 0.15 of a foot.

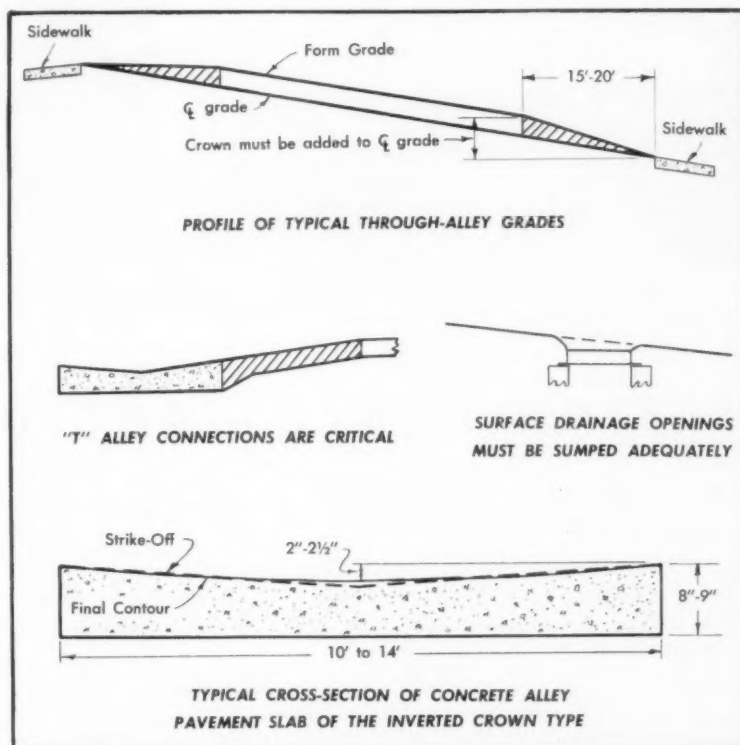
Before establishing level datum the staking engineer should compare elevation differentials at all vital points, such as at the ends and any intermediate connecting points, with those on the plans at those locations. Remember that there is little or no leeway here and the level net has to close!

Finding everything in order, the level datum should then be established from one of the points just checked, and the note book set up with that elevation as a bench mark.

Usually the centerline of an abutting street is a good choice for this point as it is off construction limits and will be available for blue tops and form grades after the grading has commenced.

grade and is a definite advantage to the contractor in realizing his yield from a load of concrete.

A longitudinal bull-float requirement may hike the price a mite but is well worth its fare as an aid in



● CROSS-HATCHED areas in this drawing are those requiring extreme care in staking and finishing if the completed job is to be fully satisfactory. See opposite page.

It is sufficient to set grade stakes every fifty feet and at grade breaks. For 10-foot slabs we usually run one line of $\frac{1}{2}$ x 24-in. rods on the inside of the form grade, centered 4'-11 $\frac{3}{4}$ " from the centerline. These are put in with the tops set uniformly 3" above the form grade so that a string line can be attached and the forms set right up against the rods. With slabs wider than ten feet we run grade on both form lines because of the difficulty of leveling-over accurately.

Sometime during the staking procedure, preferably before form grades are set, the engineer should review and check each of the abutting features, such as garage entrances that had an influence on the design of the grade. If one situation is found that can be readjusted to advantage it will be well worth the trouble.

Tread runway boards should be laid in the ground area between the forms for the trucks to run on. This assures an undisturbed sub-

preventing those minute water pockets that show up after the first rain on minimum grades.

Now the engineer can be confident that he has done everything in his power to start the job off right so he is ready for concrete.

From here on out regular procedures for inspecting concrete work should prevail. A friendly and co-operative relationship between the engineers and contractor is a must. Small things should not be fussed over but it is almost certain that the engineer will have to have the finishers "touch up" in some of the critical areas shown on the schematic drawings. It is a rare finisher indeed that will "handcraft" some of these difficult warps to the desired standard on his own volition without some "moral support".

Dogs and small boys? The only offering I have on this is to have a watchman put on the job till after the slab has set up. The last contractor we had on alley paving did this of his own free-will.



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● **GLARE IS AVOIDED** by mounting lights on 100-foot steel standards, placed in pairs at eight locations behind stands.

NATION'S BEST LIGHTED FOOTBALL FIELD

HUGE Texas Memorial Stadium sprawls over a 13-acre portion of the University of Texas campus at Austin, Texas. It has a playing field 360 feet long and 160 feet wide, surrounded on three sides by stands capable of seating 65,500. With its new floodlighting system it far surpasses the minimum illumination levels used customarily in stadia of its size. In fact, only two ball parks—New York's Yankee Stadium and Briggs Field in Detroit—have more light. An average reading at Memorial Stadium registers 112 footcandles, with the ratio of maximum to minimum footcandles being 1.72 to 1. Players see and handle a football with ease, while spectators watch in comfort from any part of the stands.

Because of the width of the stadium and sideline stands running parallel with the playing field, 100-foot poles were required to allow floodlights to be aimed at the field without causing glare to players or spectators. Sixteen Kerrigan Weldforged continuous tapered, corrosion resistant, low alloy steel standards were used. Eight floodlight locations cover the playing field. At each location two poles are used. These are based in concrete, footed against the stadium wall, and are designed to withstand winds of 100 miles per hour. Each pole top is equipped with six cross arms and two service platforms. Grouped in

rows of twelve along the cross arms are 72 Crouse-Hinds FLA floodlights.

Raising the 3½-ton steel poles into place required considerable advanced planning. To raise a pole vertically and steadily, lines were run from a gin-pole located at the top of the stadium and attached above the center of the pole. Hand lines and a winch truck were used to elevate the pole to the proper height and to jockey the base of the pole into position. Pole bases are square, measuring approximately 2 feet per side, and each fits onto four 10-foot anchor bolts.

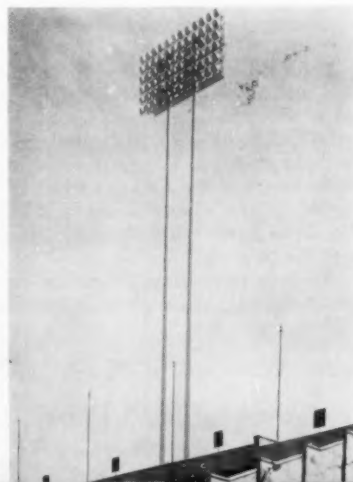
Each pole supports two service platforms, which measure twenty-three feet long and five feet overall when aligned with the platforms of the adjacent pole. Pre-welded and cross-trussed, these platforms are bolted to the poles. To reach the platforms, one of each set of poles is equipped with conventional pole steps, allowing a service man to work on all seventy-two luminaires by climbing a pole only once.

Each of the 576 Crouse-Hinds floodlights has a corrosion-resistant aluminum base, slotted to allow at least a 90-degree swing of the light. Mounting bases are sealed for accurate aim settings. A steel trunnion bracket, heavily galvanized, permits the light to be turned over for easy inspection. Attached to the trunnion bracket is a pointer with a scale to

establish the vertical position of the light. By means of a repositioning stop, a light can be restored to its original position with ease and accuracy after cleaning or servicing. All floodlight lamps for the system, which operates at an over-voltage of 10 percent, are the PS-52, 1500-watt, 115-volt, mogul base type.

A switch room for the system was constructed in the north or closed end of the stadium. A 4160-volt power service with a capacity of 1500 KW was run into the room from the utility source. Four feeder oil circuit breakers control the 4160 volts to the pole transformers, hidden from view by the concrete piers. All conduit also is hidden from the view of the spectators approaching the structure and is protected by galvanized conduits.

The \$170,000.00 floodlighting job was designed and laid out by Carl J. Eckhardt, the University's Director of Physical Plant, and installed by Brown & Root, Inc., Houston contractors, in approximately four months from initiation to completion.



CO-ORDINATION and TIMING SPEED SEWAGE TREATMENT

B. H. CRUCE,

City Manager, Greeley, Colo.

WHAT SHOULD a manager do if he comes into a new city and finds a sewage disposal plant treating only 40 percent of the sewage and the state legislature about to adopt a stringent law concerning municipalities polluting rivers and streams?

That was the condition of Greeley, Colorado, when I took over the position of City Manager on March 1, 1954. The City Councils had been discussing the problem for several years but had failed to take any positive action in the matter. It was one of the first problems called to my attention upon arriving and was placed more forcefully when the Mayor and I attended a hearing before a state senate committee investigating river and stream pollution.

It was very obvious, after inspecting the system and discussing the matter with our own engineering staff, that some major trunk lines were needed to take sewage from over loaded lines and to provide for expansion of the City. The question was, how much or how many? For this reason, I recommended to the Council that we employ a consulting engineer to make a preliminary survey of the disposal plant needs and also sewer trunk line needs.

On May 18, 1954, the Council appointed a committee of three coun-



● **REPORTS** on preliminary studies, economic feasibility and the design details are all reviewed by Mr. Cruce.

cilmen to work with the City Manager and City Engineer to interview consulting engineers and to bring back a recommendation to the Council.

On July 13, 1954, the Council employed Ken R. White, consulting engineer from Denver to make the preliminary survey. Mr. White was asked to study and report on the following:

1. Existing sewage treatment plant capacity and efficiency;
2. Feasibility of providing sewage treatment facilities and sewer service to three neighboring towns;
3. The additional plant capacity required to accommodate the City's present needs and the neighboring incorporated areas;
4. The additional plant capacity required to accommodate the City's anticipated growth by 1975 (20 years hence);
5. Existing capacity and condition of existing sewer trunk lines;

6. The repairs and improvements necessary to keep existing sewer trunk lines operating;

7. The necessary trunk lines to provide sewage service to various areas presently outside the Greeley City limits but which are anticipated to be a part of Greeley by 1975;

8. Preparation of preliminary cost estimates for each phase set forth above;

9. Make recommendations as to rate schedule required to finance each of the phases set forth above.

Mr. White presented his report to the Council November 1, 1954. To finance the complete program which he outlined would require a bond issue of \$875,000.

The Council then appointed a committee of nine businessmen to study Mr. White's recommendations along with the Council. After several meetings, it was decided that more study should be done in projecting population growth and determining proper rate schedules. Following this recommendation, the Council employed C. H. Hoper & Company, Denver, Colorado, to make a rate study and economic feasibility report of the proposed sanitary sewer system improvements as recommended by Mr. White.

The C. H. Hoper and Company were instructed to include in its report the following:

1. Study of the general economy of Greeley and of the Greeley area;
2. Past development of present Sanitary Sewer System;
3. Determination of the economic



● **DECISIONS** on the job. Resident Vern Nelson, right, checks on filter media with City Engineer George Fellows.



● **RESULT** of co-ordinated study, design and financing is needed construction underway at the earliest possible time.

feasibility of proposed improvements and a recommendation for the amount of bond issue required to finance the cost;

4. Determination of past revenues and expenses of the present sanitary sewer system;

5. Estimates of annual amounts required to pay all operating and maintenance expense and to service the proposed bond issue; and to make estimates for renewals and replacements of property and normal extensions of trunk lines;

6. Determination of rates for sewage service required to provide adequate revenues and designed to spread the cost equitably between different classes of users; and

7. Estimate future operations based upon adopting the proposed improvement program and operation under recommended rates.

At the same time, C. H. Hoper & Company was employed, the Council engaged Bosworth, Sullivan & Co., Inc., Denver, Colorado, as fiscal agents in connection with the proposed bond issue. By working closely with city officials and the City's consulting engineers, the bond prospectus was ready soon after the feasibility report.

To some extent, the work of C. H. Hoper and Company was a duplication of the work done by Mr. White. The Council, however, believed the additional expenditure and work necessary.

In addition to these studies, our own engineering staff, headed by George Fellows, registered engineer of Colorado and Iowa, was given the job of studying in more detail the sewer collecting system and to make a separate report. The report of Mr. Fellows was submitted to the Council on March 5, 1955, and the report of C. H. Hoper and Company on June 1, 1955. Each report came very close to confirming the finding contained in other reports although all were done independently.

After hearing the two latter reports, the Council decided to issue \$875,000 in revenue bonds for the Sanitary Sewer System Improvement Program.

It was unnecessary to call an election on these revenue bonds so on July 7, 1955, about one year from the start of the first study, bids were opened on the sale of the bonds.

The Council, however, had not been wasting time waiting for these final reports. Several preliminary oral reports were requested by the Council and again the council committee was instructed to work with the City Manager in interviewing consulting engineering firms to do

the design work on the proposed sewage treatment plant. On the recommendations of the committee and the City Manager, Harold Hoskins and Associates, Greeley, Colorado, were employed for the design work. The design work was so timed that bids for the construction of additional treatment plant and repair and remodeling of the old facilities were opened a few days before the sale of the bonds. The favorable bids received confirmed the several engineering estimates on that part of the projects.

It is believed by the council members that the co-ordination of all these reports and studies, having them done as much as possible simultaneously, as well as being able to get the design work under way before their completion, allowed the city to get the construction under way at least one year earlier than would have been the case if each report had been completed before starting the next one. A total of six reports were received from engineers and fiscal agents. Co-ordination and timing paid off.

Investigation Conducted on Elevated Tank Failure

LESTER LEE,

Pres., Hitchcock & Estabrook, Inc.
Consulting Engineers and Architects,
Minneapolis, Minn.

THE COLLAPSE of the Horton Watersphere at New London, Minnesota, during February of this year has caused wide-spread discussions and inquiries to this office, as well as to the Village, as to the cause of the failure. Prominent engineers from all parts of the country have visited the site. The tank was erected by Chicago Bridge and Iron Company in the fall of 1954, and was in service about 17 months before the failure. At the time of the failure there was, of course, considerable snow on the ground and seven or eight feet of frost. It was not possible to determine the cause of the failure at that time. The frost being nearly gone, on April 23, we made a thorough investigation as to the possible cause of the failure.

We found that a water service connection had been installed to a near-by house late in the fall of 1955. We excavated down to this service line and found that at one

point the pipe was within five feet of the footings. We do not know, of course, the width of the trench but without question the ground was opened something less than five feet away from the footing. The soil at that point is extremely fine sand, probably passing 100 mesh sieve but also very sharp. There were also a few rocks the size of an orange or smaller.

While it perhaps would be difficult to prove from a legal point of view that the trench caused the failure, careful investigation on the part of our firm, as well as the engineers of Chicago Bridge and Iron Company, discloses no other probable cause. Footings were down eight and one-half feet and carried a load of less than 3,000 lbs. psf., plus wind pressure. At the time of the failure there was practically no wind. With a wind of 100 miles per hour the total load would still be less than 4,000 lbs. psf. The fact should be noted also that the concrete footings are not cracked at any place. The footing nearest the trench has settled about six inches. The footing furthest from the trench has raised about two and one-half feet.

The Chicago Bridge and Iron Company were deeply concerned about this failure and have shown complete cooperation with the Village and with the Engineers. Upon completion of the investigation the Chicago Bridge and Iron Company have been wholly absolved of all responsibility for the failure. However, as a gesture of good will and sound public relations, even though the guarantee period had expired, the Chicago Bridge and Iron Company has voluntarily agreed to erect a new watersphere for the Village of New London, at no cost to the Village. This will be completed by the coming fall.



● PHOTOGRAPH taken shortly after failure of tank at New London, Minn.

ROADSIDE DEVELOPMENT PROGRAM

H. J. NEALE, Landscape Engineer, Virginia Department of Highways, Richmond, Virginia

WITH AN AREA of 39,893 square miles, Virginia measures 470 miles east and west and 196 miles north and south, ranging in elevation from sea level at the eastern coast to 5,719 feet at the top of Mount Rogers. The road system is in excess of 49,000 miles. It is easy to see that roadside development throughout the State differs greatly, one section from another. Climatic conditions vary from the mild temperatures of the southern Atlantic coast to the zero temperatures of the southwest mountain region. Because of this wide climatic variance across the State, there exists a wide range of native plant materials and many types of soils in which they grow.

The soils of Virginia may be classified under the following headings:

Coastal Plains
Piedmont Plateau
Blue Ridge Division
Limestone Valley and Uplands
Appalachian Mountains and Plateaus

The Coastal Plains, geologically speaking, is the youngest soil formation found in the State. This area extends from the Atlantic Coastline to the Fall Line which runs from Washington, D. C. through Richmond and Emporia. Throughout this region will be found rich marl deposits and, notably in the Dismal Swamp area, an accumulation of peat material.

In general, the soils of the Coastal Plains are the sandiest found anywhere in the State. However, there are large local areas where the underlying subsoil is rich in clay, giving

it the characteristic of heavy plasticity.

On the basis of physical characteristics that affect turf growing, the soils may be grouped as follows: (1) Light colored well-drained soils; (2) Light colored poorly-drained soils; and (3) Dark colored poorly-drained soils.

In the flat wooded regions, the soils are predominantly poorly-drained, while in the northern section the land is gently rolling and much better drained.

Along the western part of the Coastal Plain the soils consist chiefly of greensand, sandstone, clay and shell marl. In addition to these, the soils of the eastern section contain fossils and sedimentary material.

The main characteristics of this soil are its ease of manipulation,



● CLOD-BUSTER consists of a long chain with spikes attached and one end weighted. It is used to condition slopes.



● HYDRAULIC seed and fertilizer spraying machine shown in operation. Application can be made to 75 ft. with 90 psi.



● MULCH blower with jets for asphalt application in operation. Asphalt must be thin enough to be applied as a mist.



● PERFECT job of roadside development in Virginia results from application of the principles outlined in this article.

high erodibility and porosity. When topsoil is available, the mean temperature of 58 degrees and an average annual rainfall of 45 inches make the establishment of turf relatively easy. However, the inability of many soils in this area to retain nutrients makes it necessary to supplement them with regular and heavy applications of fertilizers.

Although the top soil is sandy and highly erodible, drainage is the main problem in the Coastal Plain Area and not erosion. In local areas, however, where the land is rolling, erosion may become a problem of considerable importance. This condition arises because of the impermeable quality of the heavy clay subsoils.

The *Piedmont Area* contains the oldest soils found in the State. The soils within this area were derived from three distinct geological formations:

(1) Those derived from the acid rock groups (granite, gneiss, mica schist) and basic rocks (diabase, gabbro, diabase). The most extensive, and most important, soils of this area are those derived from acidic rock.

(2) Slate-belt soils make up about three percent of this area. This is a finely textured soil which is high in silt.

(3) Triassic formations comprise about nine percent of the Piedmont soils and include brownish sandstone, red shale and some conglomerate.

In general, the texture of the soils of the Piedmont area may be classed as sandy loam, loam, silt loam, and clay loam. Although these soils were produced under a forest cover, moderate temperatures and heavy rainfall have prevented a buildup of the organic content. The soils are not frozen to any great depth, nor for very long periods during the winter months, therefore, active leaching continues throughout the greatest part of the year. This results in the accumulation of large quantities of soluble plant nutrients in the subsoil. Because of the texture of the topsoil and the climatic conditions of this area, an accumulation of lime in the topsoil is extremely rare, although calcium is present in the mineral composition of many of the underlying materials.

The effect of climatic factors on the soils of this area can be readily observed as one travels northward from the southern border of the State. In the northern part of the Piedmont the topsoil and the subsoil are both darker in color. This



● EROSION control was a problem before establishment of method for stabilizing slopes. Ditches were difficult to keep clean and shoulder area costly to maintain.

indicated less leaching of organic matter from the topsoil. Thus, the topsoils of this northern section have a greater organic content and contain more plant nutrients than do those of the southern section.

The soils of the *Blue Ridge Division* were developed from igneous and metamorphic rock. Unlike the Piedmont Area, the soils of the Blue Ridge Division are frozen for long periods during the winter and to a greater depth. This prevents the soluble plant nutrients from leaching out of the topsoil as rapidly as in the Piedmont Area. Because of the reduced leaching and the deeper freezing and thawing which occurs in the Blue Ridge Area, the soils are darker in color and more open and porous than those of the Piedmont.

The greater portion of the soils of this area have a highly absorptive surface and an open, porous nature which resists the tendency of erosion. Therefore, erosion in this section of the State is not so great a problem as it is in the Piedmont and some sections of the Coastal Plains.

The texture of most of the soils of this region is a fine sandy loam or loam. The surface color ranges from dark gray to brown. They are rather crumbly and quite productive. However, those soils whose parent material was shale and sandstone are inherently poor.

The average mean temperature of this area is 53 degrees, and the rainfall averages 45 inches annually.

The soils of the *Limestone Valley and Uplands* are derived from decomposed sedimentary rock consisting of limestone, shale, sandstone

and quartzite. The valley soils are mostly light in color, ranging from grayish yellow to brown in the surface soil and from brown, brownish yellow, yellow, yellowish red and brownish red to red in the subsoil. The texture is mainly loam and silt loam with fine sandy loam in some places. The topsoil is normally low in organic matter and plant nutrients because of the rapid leaching process. Although the majority of the Limestone Valley and Uplands soil is derived from limestone or materials high in carbonates, free carbonate of lime is generally lacking.

A heavy clay subsoil which prevents rapid absorption of water and a loose clay or loam surface make the soils of this area susceptible to erosion; in general these "limestone soils" are inherently fertile.

The soils of the *Appalachian Mountains and Plateaus* come from sedimentary origin, largely sandstone and shale with some limestone in places.

Nearly all the soils in the southern portion of this area are light in color, ranging from light gray to grayish yellow and light brown on the surface and yellow or brownish yellow in the subsoil. Although these soils have been developed under forest cover, the temperate climate has not been favorable for the accumulation of large amounts of organic matter. In the northern portion of the region the soils become somewhat browner in the surface and subsoil showing the effects of a colder climate.

The soil of the *Appalachian Mountains and Plateaus* are quite susceptible to erosion. This characteristic is particularly noticeable where culti-



● GRASSY bank, after erosion control has been accomplished, prevents flow of mud into ditch and reduces maintenance costs. Road shoulder is well maintained.

vation has been in practice on rolling and steep slopes and where adequate cover has not been maintained on pasture slopes.

Establishing Turf

Turfing is one of the major operations on the roadsides of Virginia. Grass, of all plant growth, is the most desirable on the areas immediately adjacent to the paved portion of the roadway. An established turf will thrive with a minimum amount of care and will withstand gross neglect for long periods of time. A good sod will prevent the influx of weeds and scrub plant growth which will, if allowed to thrive, be a hazard to motorists using the highway. Continuing research and experimentation are making it less and less of a problem to establish a good turf on the roadsides of Virginia.

The Virginia Department of Highways, in cooperation with the Virginia Polytechnic Institute, has set up test plots along highways to determine the value of various grasses under roadside conditions. The area for the plots is divided into two main sections—one for Fertilizer Experimentation and the other for Seed Experimentation. The area is further divided to determine the effect of lime in combination with the various seed mixtures and the different rates of application of fertilizers. Although these plots are relatively new, they have contributed a great deal toward establishing better turf on the roadsides.

Prior to the establishment of the Experimental Plots, seed mixtures used for the roadsides consisted of those grasses most likely to thrive in a particular location. This re-

sulted in a weak stand of one or two of the grasses used, for not enough seed of any one variety could be included in the mixture to produce a thick stand. The plots show exactly which of the grasses are best suited to each locality. Now the seed mixtures are made up of only those grasses which we know will thrive and thick stands are the results. The major grasses now used are Bluegrass in the western section, Kentucky 31 Fescue in the central section, and Bermuda Grass in the eastern section of the State.

The use of fertilizers has changed radically since the establishment of the test plots. It has been found that to get good turf, the soil must be supplemented with food if the grasses are to thrive. This has resulted in much heavier applications of fertilizers on our roadsides.

The use of lime is better understood as a result of its application on the plots. We have found that in many sections of the State where lime was applied, it was not needed and was a waste of time and money. In other sections we found that lime applications greatly enhanced turf establishment. The most startling discovery was that additional lime was needed in many areas where the soil came from limestone rock. This was due to the fact that, although lime is in the soil, it is in an insoluble form and the plant nutrients applied are not available until additional lime is added to break up the bonds in the soil. We are now applying lime where it is beneficial and omitting its application in areas where it is not needed.

It is the aim of the Landscape Division of the Virginia Department of

Highways and the Virginia Polytechnic Institute to establish more of these plots until they are located in every section of the State. When this is accomplished, the major problems of turf establishment throughout the State will be solved.

The methods used for turfing throughout the State have been revolutionized by commercial and homemade equipment. Hand seeding is seldom, if ever, done.

Soil Preparation

On flat areas and gentle slopes, tractors are used to prepare the seed beds. The soil is scarified to a depth of several inches and is not smoothed over. When left in this roughened condition, the soil tends to retain more of its moisture, will not erode easily, will promote the growth of the grasses, and holds the mulch in place. Farm drills are rarely used for seeding on such areas. On very high cuts that cannot be reached by machinery, hand seeding is employed. However, this is seldom necessary. It has been found that laying a mulch by machinery is not only faster than doing it by hand but it results in a more uniform and closely knit cover over the soil.

There are a wide range of materials that may be used as mulches. However, because of the vast areas that have to be covered, it is uneconomical to use materials other than straw or spoiled hay. This is applied at the rate of approximately two tons to the acre. Although tobacco stems make a splendid mulch, the necessity of applying about five tons to the acre prevents its use over large areas. However, both sawdust and tobacco stems are excellent for use on seeded shoulders, (and are used in such locations) for they are less susceptible to being scattered by wind created by passing vehicles than is a straw mulch. The use of asphalt as a mulch has not been successful in this State and is not used.

After the mulch has been laid, seed and fertilizer are applied to the roadsides. This seemingly backward procedure has come about with the advent of the hydraulic seed and fertilizer spraying machine. This machine allows the seed and fertilizer to pass, in water, through the mulch to the soil. With the use of a mulch blower and the hydraulic seeder, slopes too steep for a man to walk on may be treated and covered with grass. By applying the mulch first, the seed and fertilizer are held in place where they hit. Washing of the seed is thus prevented and the

tops of the slopes develop a turf as well as the bottoms. A more uniform spread and a greater stand of grass are the results of this application method.

Major Equipment

The major equipment used for roadside development consists of tractors, hydraulic seed and fertilizer spraying machines and mulch blowers. The tractor is equipped with an over-head loader, cultivator, disc-harrow, fertilizer and grain drill, post-hole digger, and other common units for handling and cultivating soil.

The first hydraulic seed and fertilizer spraying machine used by the Virginia Department of Highways was designed by our Landscape Division and developed by the Equipment Division. The 1000-gallon tank is mounted on a suitable truck which, by power take-off from the drive shaft, propels a propeller-type agitator. This machine is equipped with a centrifugal pump driven by a gasoline motor capable of producing approximately 150 psi. The material is usually applied at 90 psi. and can be sprayed for a distance of about 75 feet, using an adjustable nozzle. Under average conditions, this equipment will seed and fertilize about one acre of land per hour. It can also be used during light rains and when the soil is wet, as no equipment touches the soil to cause packing or puddling.

Grass seed is usually applied at the rate of 80 pounds per acre. The fertilizer is applied at the rate of two pounds each of nitrogen, phosphate, and potash per thousand square feet of area. The amount of water and solids mixed at one time is in direct ratio to the size of the tank. This mechanized treatment has greatly reduced the cost of seeding the roadsides.

The mulch blowers are of various types. The first one used here was developed from an ensilage cutter by attaching a gasoline motor, removing some of the cutter blades and attaching a light pipe, which could be maneuvered vertically and horizontally, to distribute the mulch. Today, the mulch blower has been greatly improved, and we have purchased one of the commercial types. Through twin jets at the exhaust end of the blower pipe, cut-back asphalt or asphalt emulsion is applied with the mulch material. This tends to hold the straw in place on the ground. (About 200 gallons of asphalt can be carried on the blowing machine.) Although cut-back asphalt has been used satisfactorily,

it has been our experience that asphalt emulsion is easier to apply and a smaller quantity is required to cover the same area than the cut-back. It requires about fifty gallons of the emulsion per ton of straw mulch. No special type of asphalt

"Do-It-Yourself" Traffic Controller



The Delaware State Highway Department has a capable "do-it-yourself" who has installed an Electro-Matic traffic controller on a Pfaff & Kendall aluminum traffic standard through use of a conduit box. This rigid, functional mounting device saves an estimated \$60 on each intersection where it is used.

is necessary as long as it is thin enough to be blown from the jets in a mist.

The Clod-Buster is a commercially built piece of equipment consisting of a long chain to which spikes are attached. One end is weighted and the other end is attached to a tractor. The chain is then pulled over the face of the cut or fill. It is used on those sections of the roadside where it is not feasible to use tractors, such as on steep cuts and fills. As the spikes are rotated over the face of the bank, the soil is stirred up, leaving a rough surface, and large clods of earth are broken up into small pieces. Shallow erosion scars are also filled in the process. This treatment leaves the cut or fill in condition to be mulched and seeded.

Steep Slopes

In many places along our roadsides, slopes are encountered which

are too steep to be covered with grass. They cannot, however, be left bare. In these instances, some type of rapid growing vine must be used. Most often this is honeysuckle. To prepare the beds for the plants, trenches, about twelve inches wide and as deep, are dug across the face of the slope at an angle of approximately thirty degrees. These are back-filled with topsoil to which a small amount of fertilizer has been added. The plants are usually collected from an established plot. The tops of the plants to be moved are cut to the ground. The mat of roots in the soil are cut into strips or blocks in the manner of cutting sod. These strips or blocks are then placed in the prepared trench and, if the grade necessitates it, pegged into place. The space between the trenches, normally three feet, is mulched and then seeded with a mixture of Domestic Rye Grass and Korean Lespedeza.

Kudzu has been used on cut and fill slopes throughout the State. However, because of its rapid growth and difficulty of control, it is not recommended where other plant material may be used.

Through the years, Roadside Development Policies have changed many times. As road engineering changes, so must Roadside Planting. The two are never static. With the proposed Interstate System of Highway Design it became evident that Roadside Planting must be changed. A new policy was drawn up by the Landscape Division of the Virginia Department of Highways this past year to meet the proposed changes. In brief, the new Policy may be stated as follows:

(1) Trees are not to be planted on highways with less than 110-foot rights of way.

(2) Trees are not to be planted closer than 20 feet from the edge of pavement.

(3) No trees are to be planted in medians less than 50 feet wide. (This is necessary to meet (2) above.)

(4) Exceptions to the above three parts are allowed in urban areas where speed limits have been reduced and on many secondary roads that prohibit increased speeds.

(5) In all cases, a minimum sight distance of 1000 feet must be maintained at all intersections and cross-overs.

Editor's Note: Some of the more common plants used in Roadside Development in the State of Virginia have been listed by the author. They are omitted here but it is believed the list would be furnished by him to those who may have need for it.

The MAGNETIC FLOW METER

R. H. BABCOCK
Utilities Industries Division
The Foxboro Company,
Foxboro, Massachusetts

Condensed from a paper presented at the Oklahoma Water, Sewage and Industrial Wastes Short Course at Oklahoma A & M College, Stillwater, Okla.

FOR EFFICIENT operation of the modern water or sewage treatment system there must be accurate measurement and precise control of flow. Nor is precision the only requirement. The method used must also be reliable. Equipment must be durable and require but little care. Functionally, it should possess certain fundamental hydraulic characteristics. Rigid as these requirements are, they are more nearly met by the Magnetic flow meter than by any device preceding it in the history of flow metering.

Although the instrument itself is new to the field, the principle of operation was described as long ago as 1887, the year Clemens Herschel developed the familiar Venturi tube. Fifty-five years before, the English physicist, Michael Faraday, made note of the principle of electromagnetic induction in his dairy. It was 1839 before he put it to test in his now famous Thames experiment. Placing two copper wires in the Thames River, and counting on assistance from the earth's magnetic field, he attempted to measure the flow of river water. The sensitivity of his voltmeter being somewhat less than he anticipated, the attempt did not succeed. However, the fact that the principle was carried to the experiment stage shows how much early thinking went into the proposition and how great was its influence on the development of the present instrument.

No further work of major importance was done on electromagnetic metering of flow until Smith & Sleppian developed their magnetic ship log, applying for a patent on the device in 1917. Since that time an impressive number of separate investigations has been carried on. These earlier attempts failed to solve the problem of providing high accuracy and wide range of sizes.

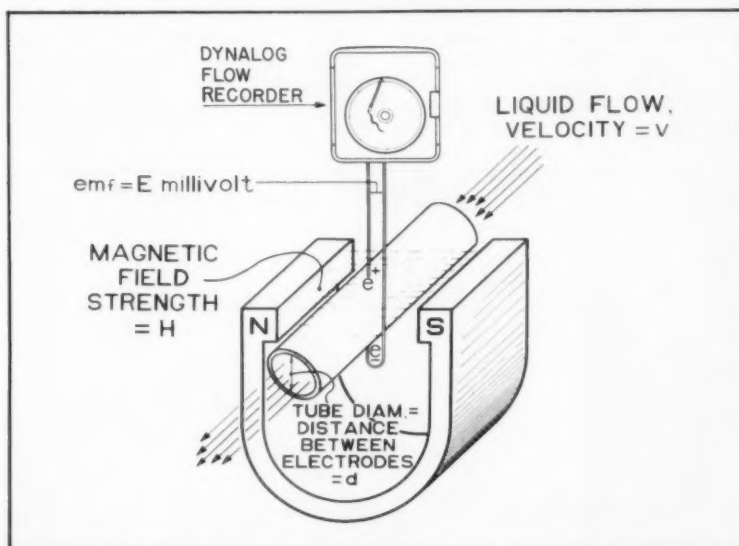
How the Meter Works

In understanding how the Foxboro magnetic flow meter complies with strict flow measurement re-

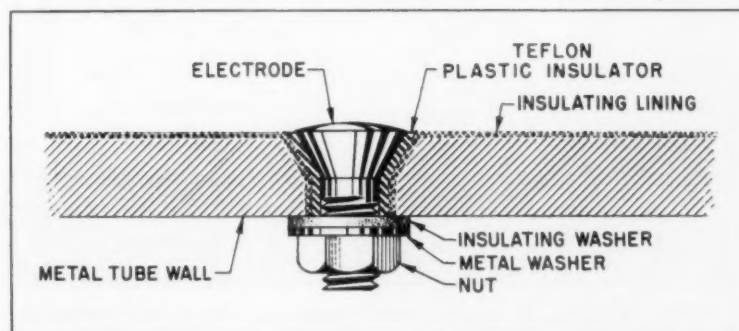
quirements, it is necessary only to review Faraday's principle, often referred to as the "right hand law of electricity". In general, this law states that if a magnetic field is generated in one direction and a conductor is moved at right angles to the field, a voltage will be generated which is directly proportional to the speed of the conductor and the strength of the field. Translated into terms of actual instrument design, this law becomes: if an AC electromagnet generates a magnetic field of constant strength at right angle through a nonmagnetic flow tube and conductive liquid is passed through the tube, a voltage will be generated which is directly proportional to the rate of flow of the liquid. To avoid shorting out the voltage, the tube is lined with an

insulating material. In direct contact with the liquid are two electrodes set into opposite sides of the tube and insulated from it. Lead wires from these electrodes transmit the voltage signal to an electronic Recorder, producing a chart record in appropriate units of flow. Since flow is equal to the fixed area of the metering tube times the velocity of the fluid traveling through it, a direct reading of flow is obtained.

In evaluating the adaptability of the meter to typical water and sewage treatment applications, the question of turbulence or variation of the flow profile naturally arises. It has been found that neither condition produces any adverse affect insofar as meter accuracy is concerned. The meter actually adds incremental velocities occurring across



● DIAGRAM illustrates principle of the magnetic flow meter. The flowing liquid, a conductor moving at right angles to a constant strength field, generates a voltage between electrodes $e+$ and $e-$ which is proportional to liquid velocity, v .



● ELECTRODES are set at opposite sides of tube and insulated from metal wall.

the fluid separating the two electrodes. This means that stratified variations in viscosity or flow rate, though they may affect the flow profile, are averaged out by the meter which responds solely to average velocity.

Proof that no error results from this source comes from detailed mathematical calculations for symmetrical flow patterns which confirm that laminar or turbulent flows have no effect on accuracy. In the case of non-symmetrical flow patterns, which are difficult to handle mathematically, accuracy was demonstrated by actual experiments. Half the area of the measuring tube was blocked to produce changes in the flow pattern and excessive turbulence was built up but there was no measurable change in accuracy.

Further test work conducted by the Alden Hydraulics Laboratory, Worcester, Massachusetts, culminated in a test curve which shows virtually no deviation from a normal calibration curve when a pipe elbow was installed directly upstream of an 8-inch magnetic flow meter and swirl was artificially induced.

It will be remembered that one of the basic conditions of electromagnetic metering is that the fluid

to be measured must be conductive. Only when a conductor moves through a magnetic field will there be a measurable EMF generated across the electrodes. This brings up the question of what constitutes a conductive fluid for purposes of electromagnetic flow measurement. In water and sewage treatment installations, conductivity is not a problem since the fluids dealt with are usually of the magnitude of 100 micromhos or greater. This is far above the minimum conductivity requirement which, for an 8-inch magnetic flow meter using 300 feet of lead wire between transmitter and receiver, is 50 micromhos. However, it has been demonstrated that even at values below 50 micromhos, the only adverse effect is a wandering zero when there is no flow in the line. When flow resumes, the meter reads accurately.

Coatings and Deposits

Much testing was done to assess the effects of slimes or greases that can be expected to coat the electrodes of a meter used in sewage plant operation. It was found that the meter will continue to read correctly if there is a concentric buildup of residue and slime on

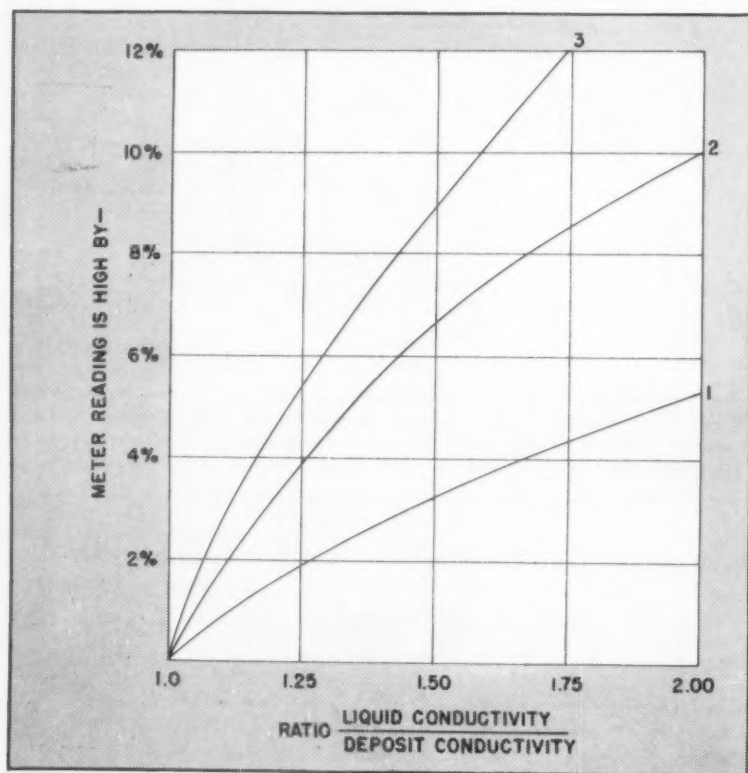
the walls of the metering tube, providing the buildup is conductive. For example, assume that there is a flow of given rate through a clean tube. Now, assume that a concentric buildup takes place, blocking half the area of the tube. Obviously, the velocity of flow must be doubled in order to maintain the volume at its original value. At first it would seem that with the area of the tube halved and the rate of flow doubled, the generated voltage will be the same as with a clean tube. In actual practice this is true, but mathematically a higher reading would be expected. For instance, when the area of the tube is halved, the diameter (distance between the two electrodes) is reduced to .707 instead of .5 of the original dimension. It would seem logical that the meter would read too high by a factor of .707 divided by .5.

However, mathematical and experimental analysis both show that the resistive shunt effects of the buildup are sufficient to decrease the generated voltage by the exact amount necessary to cause the meter to read correctly.

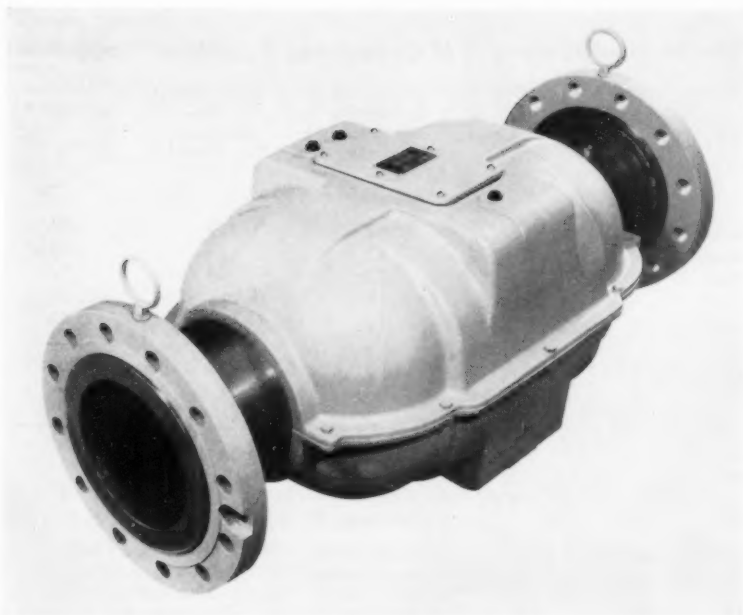
Most buildups will have the same conductivity as the flowing liquid because they are usually porous and are continually soaked in the flowing liquid. At the other extreme are buildups which are good insulators, thereby preventing the electrodes from sensing any of the voltage generated. The latter will prevent the meter from reading above zero. A figure herewith shows the effect of the conductivity of the buildup on the accuracy of the meter. While the results will be much the same for a stagnant ring of viscous fluid, the ring will almost certainly have the same conductivity as the liquid itself.

It should be noted in connection with the question of buildup that it is less likely to occur in the magnetic flow meter because the tube is lined with rubber or plastic materials. These liners do not permit substances to adhere to them nearly as readily as do cast iron or concrete pipe. In fact, where a Kel-F liner is used, it is difficult to find a substance that will adhere without a very elaborate curing process.

Because the transmitter section of the meter is essentially an electric generator whose output must be recorded by an electronic receiver, it has been necessary to establish certain minimum full scale voltages that fall within the sensitivity of the instrument. These are based upon a minimum full scale velocity of five feet per second. This means that the minimum full scale obtainable



● EFFECT of buildup of slimes or other deposits on walls of the metering tube. Curves 1, 2 and 3 are equivalent, respectively, to 19, 36 and 50 percent reductions in area. Resistive shunt effects of buildup tend to compensate for high readings.



● THIS COMPACT Magnetic Flow Transmitter fits readily into plant pipe lines.

with a 6-inch meter is 450. It can be read down to zero. There is no upper limit on meter ranges. For instance, a 6-inch meter can be built with a range of 1000. However, with the lower limit a factor, it would be impossible to furnish a full scale range of 200.

Since the magnetic flow meter is

not subject to the effects of upstream disturbances (elbow, turbulence, etc.), it is possible to predict accurately and in advance of installation what the accuracy of the meter will be. It can be stated that the meter, including transmitter and recorder, has an over-all accuracy of 1 percent.

Applications

From this discussion of the fundamental characteristics of the device, it can be appreciated that there are application possibilities far beyond the scope of conventional metering equipment. For the first time, industry has been able to measure successfully the flow of drilling mud to an oil well. It is the first to give an accurate measurement of the flow of latex and water mixtures, as well as acid and rock slurries. The food industry, recognizing its sanitary features, has put it to use in the measurement of beer, fruit juices and tomato products, appreciating the fact that there are no piping connections or crevices where food can accumulate and decompose.

Viewed by the water works engineer, the meter has certain obvious application advantages. It adds no more loss of head to a hydraulic system than does a similar length of straight pipe. Therefore it has definite merit in water pumping station applications where power costs are important. When used as the primary device for a filtration rate controller, it produces less permanent head loss across the filter, thus permitting increased rates of flow. To the sewage plant operator the new meter brings relief from a number of vexing problems arising from the difficulty of measuring raw and returned sludge.

CHARACTERISTICS of REFUSE IN NATIONAL PARKS

DURING the summer of 1954, the Public Health Service assigned personnel to study the various phases of refuse collection and disposal in certain parks, at the request of Paul McG. Miller, Chief Engineer of the National Park Service. The Public Health Service was asked to observe and evaluate present practices, test relatively untried methods of disposal under field conditions, and collect basic data concerning the characteristics and quantities of refuse produced in the National Parks. The last is necessary to facilitate planning and design of collection and disposal systems and plants.

Field investigations were per-

MALCOLM C. HOPE,

Sanitary Engineer Director, and

LEO WEAVER,

Sanitary Engineer,

Division of

Sanitary Engineering Services,

Public Health Service,

Department of

Health, Education and Welfare

Washington, D. C.

formed in Shenandoah National Park, Virginia, by Herbert A. Bevis, PHS Region III, Washington, D. C.; in Yosemite National Park, California, by Z. D. Harrison, PHS Region IX, San Francisco; and in Glacier Park, Montana, Grand Teton and Yellowstone National Parks, Wyoming, by Leo Weaver, Division of Sanitary Engineering Services, PHS Headquarters, Washington, D. C.

Although most of the information collected pertained to peculiar conditions existing in the respective parks, a substantial amount of data was collected concerning the quantities and composition of refuse from

their hotels, campgrounds, picnic areas, and headquarters areas. The data was obtained by complete weight and volume studies and physical analysis of representative samples of the refuse over a period of one week for each installation.

These data are adaptable, we believe, for use in similar areas, such as State parks, summer camps, and resorts.

Lodges and Hotels—The median of the average quantity of refuse produced approximated 3.5 pounds per capita per day, and 0.4 cubic foot per capita per day. The median of the average quantity of garbage produced per capita per day approximated 2.0 pounds and 0.1 cubic foot; for rubbish it was 1.3 pounds and 0.4 cubic foot, respectively. The median of the average relative amount of garbage and rubbish in the refuse was found to be some 60 percent garbage and 40 percent rubbish by weight, and 15 percent garbage and 85 percent rubbish by volume. (Actually, some ashes were included, but the relative error is not significant.)

There were marked differences in the amounts collected from the various types of accommodations. At Glacier National Park, two hotels showed averages of 2.30 and 1.89 pounds of garbage per capita per day, while cabins averaged 0.75 pound. The lodge at Shenandoah National Park produced 2.35 lbs., and the lodge at Yosemite 1.92 lbs.; the hotel at Yellowstone 2.02 lbs. and the hotel at Yosemite 5.04 lbs. per capita.

The relative quantities of garbage and rubbish remained very constant for similar accommodations at the various parks. Except for the lodge at Yosemite, all lodges and hotels studied at Glacier, Shenandoah, Yellowstone and Yosemite showed between 60 and 62 percent garbage and 40 and 38 percent refuse by weight. Volumes were not as uniform. The cabins at Glacier and the lodge at Yosemite showed 42 and 50 percent respectively of garbage by weight.

Campgrounds and Picnic Areas—The median of the average quantity

Table I—Physical Analysis of Garbage and Rubbish in Campgrounds

Material	Glacier Park Appar, Fish Creek, Avalanche, and Sprague Creek	Shenandoah Park Big Meadows (campground and picnic area)	Yellowstone Park Mammoth Hot Springs	Median values
(percentages by weight)				
Garbage	26	40	20	26
Paper	25	20	29	25
Glass	24	12	14	14
Metal	25	15	31	25
Miscellaneous	—	13	6	10
Total	100	100	100	100

Table II—Physical Analysis of Garbage and Rubbish in Miscellaneous Areas

Material	Yellowstone Park Park headquarters area	Yellowstone Park Tourist cabins Mammoth area
Garbage	50	42
Paper	27	33
Glass	10	2
Metal	9	11
Miscellaneous	4	12
Total	100	100

of refuse produced approximated 1.4 pounds and 0.2 cubic foot per capita per day. Physical analysis of a limited number of samples indicated that campground refuse averaged 40 percent garbage and 60 percent rubbish by weight (excluding ashes), and about 20 percent garbage and 80 percent rubbish by volume. Swift Current in Glacier, Big Meadows in Shenandoah, and Camps 4 and 14 in Yosemite had nearly the same garbage production—close to 1.5 lbs. per capita per day; but other campgrounds in Glacier and Mammoth Hot Springs in Yellowstone were markedly lower at about one-half pound.

Although no specific per capita data from picnic areas were ob-

tained, an estimate that could be used, based on field observations, would be 0.4 pound and 0.07 cubic foot per capita per day.

Park Headquarters Areas (including utility-area production)—The median of the average quantity of refuse produced was 2.0 pounds and about 0.4 cubic foot per capita per day. Several physical analyses of refuse from this source indicated a content of from 50 to 55 percent garbage and 45 to 50 percent rubbish by weight. Results were reasonably uniform with Glacier at 2.82 pounds; Yellowstone at 1.52 lbs; and Yosemite at 2.03 lbs.

Data from Yosemite Park indicated a ratio of garbage to rubbish of 1:4 by volume.

● BEARS can be problems in waste disposal. They like to dig for their food and keeping refuse covered is difficult.



● INCINERATION may offer a solution to park refuse disposal. This unit is at Headquarters Area, Glacier Park, Mont.



CONTROLLING SEWAGE FILTER FLIES

ERNEST W. LAAKE

City Entomologist

Public Health Department

Dallas, Texas

THE VECTOR CONTROL Section of the Dallas, Texas, Public Health Department recently made investigations in an attempt to develop an efficient, practical and economical method for controlling filter-fly larvae (Psychodids) in trickling filters used for sewage treatment. The objective of the investigation was to develop: (1) a method of treatment that was simple and rapid in application to the rock filters; (2) a chemical or larvicide that would kill the filter-fly larvae without injuring the organic film on the media and would not adversely affect the treatment process; and (3) a procedure that would not require flooding or discontinuance of the normal operation of the filters for any length of time while they are undergoing treatment.

For the study a test procedure was designed by which the candidate larvicides could be tested in the same way as if the chemical admixed with the sewage were applied to the filters by rotary or stationary sprinklers. Obviously, no other method of applying the larvicide to the filters could be simpler or less expensive because no equipment and very little labor would be necessary if the treatment were made by or through the sprinkler system already in operation for sewage treatment.

The larvicides selected for this study were primarily those among the chlorinated hydrocarbons and organic phosphates that were known to be effective for the control of housefly (*Musca domestica*) and other fly larvae. In order to simulate as nearly as possible the application of a larvicide by the arms of the rotating sprinklers over the filters, which was the ultimate aim of our development, emulsions in sewage



● INSECTICIDE is added in a steady stream for one minute to sewage flowing directly to trickling filters. Amount used is based on predetermined flow of sewage.

of the test compounds containing from 5 to 1,000 ppm or more of active ingredients were sprinkled over rocks in minute improvised filters heavily infested with larvae and pupae. Duration of application varied from 15 to 20 seconds to several hours or until the larvae and pupae were moribund or dead. By this technique the effective filter fly larvicides could be determined quite rapidly and in a manner comparable to that in actual practice. The test procedure was found to serve well for screening the candidate insecticides and for determining the concentration and time required to control the filter fly larvae and pupae.

Methods of Application

The results of our early tests showed that the two common species of filter flies *Telmatoscopus albipunctatus* (Will.), a large dark species, and *Psychoda alternata* (Say), a small pale species, could be controlled by simply adding (a) a small amount, or a low concentration of an effective filter-fly larvicide at a constant rate of continu-

ous flow for a period of 2½ to 3 hours to the flow of sewage going to the filters; or (b) a large amount, or a high concentration of the larvicide in the same manner but for a short period, usually for only a minute or two. For either of these methods of treatment the amount of sewage, in gallons per minute, going to the filters must be accurately predetermined in order to know precisely the amount of larvicide to add to obtain a concentration effective for controlling all the immature stages of the flies. After testing these two methods in actual practice in the field we found that the short or rapid method of treatment was by far the best and most economical because it requires very little labor. Once the flow of sewage in gallons per minute going to the filter is accurately known, the amount of larvicide required can be determined quickly. The larvicide is then added to the sewage over a period of one minute in a continuous, steady stream at the rate of one gallon of larvicide per 500 gallons of sewage. The concentration thus obtained will

be approximately 809 ppm if the emulsifiable concentrate of the larvicide to be used contains 40 percent active ingredients, or approximately 1,150 ppm if the concentrated larvicide contains 55 percent active ingredients. Rapid and perfect emulsification of the concentrated larvicides in the sewage is highly essential before the sewage reaches the sprinklers.

Effective Compounds

The insecticidal compounds that gave good control of filter-fly larvae during the summer season were mixtures containing an organic phosphate and a chlorinated hydrocarbon. Two of these mixtures, known under trade names of Psycon and Malrin, were tested in the filters of three sewage treatment plants. The results of both summer and winter tests with these mixtures are as follows:

On rather heavily infested stone, the number of larvae on which was counted, with 404.5 ppm of emulsifiable concentrate (10 percent Dieldrin and 30 percent Malathion), control was 43.3 percent; 809 ppm of Psycon gave a control of 99.85 percent; and 919 ppm killed all larvae. Another test, in December, with air temperature near 50° F, using 809 ppm, gave a 57.2 percent kill. An emulsifiable concentrate (37 percent Perthane and 18 percent Malathion, at 1,150 ppm gave 94.1 percent kill; Malrin at 1,150 ppm, gave 99.4 percent kill. Two winter tests with Malrin, using 1,150 ppm, gave 63.4 per-

cent kill at 50° F and 20.8 percent at "near freezing" in January, 1956.

Both Psycon and Malrin gave good results on larvae in summer tests, but no statistical data on pupae mortality was obtained. On the basis of several observations it is indicated, however, that Psycon is superior to Malrin for controlling the pupal stage of the two species of *Psychodids* present in local filters. Apparently worms and snails are not affected; in fact, their numbers appear to increase after treatment with Psycon and Malrin in the absence of competition from filter-fly larvae. There has been no evidence following our tests that treated effluents subsequently discharged into the river were toxic to fish. Inasmuch as the chlorinated hydrocarbons are known to be very toxic to fish it would not be advisable to use these insecticides on a large scale unless it is certain that dilution below the hazard point for poisoning fish takes place in the secondary tanks before treated effluent is discharged into streams stocked with fish.

Number of Treatments

The number of treatments needed during a season to control filter-fly breeding has not been determined. It has been noted repeatedly, however, that unless a very high kill of larvae and pupae is obtained by a treatment, the population of larvae and pupae in the filter increases again at a very rapid rate and to large numbers in the course of two to three weeks. When such rapid

increases of larvae are noted shortly after treatment the filters should be retreated at weekly intervals until the flies are brought under control. In one test with Psycon in which a 100 percent kill of the larvae and pupae was obtained, the filter remained free of larvae for nearly a month and although a very heavy organic film formed on the rocks, no ponding resulted. A 100 percent kill is most difficult to obtain with one treatment and may not be desirable if snails and worms are not present in order to prevent the formation of too heavy a film which in turn could result in ponding on the filter.

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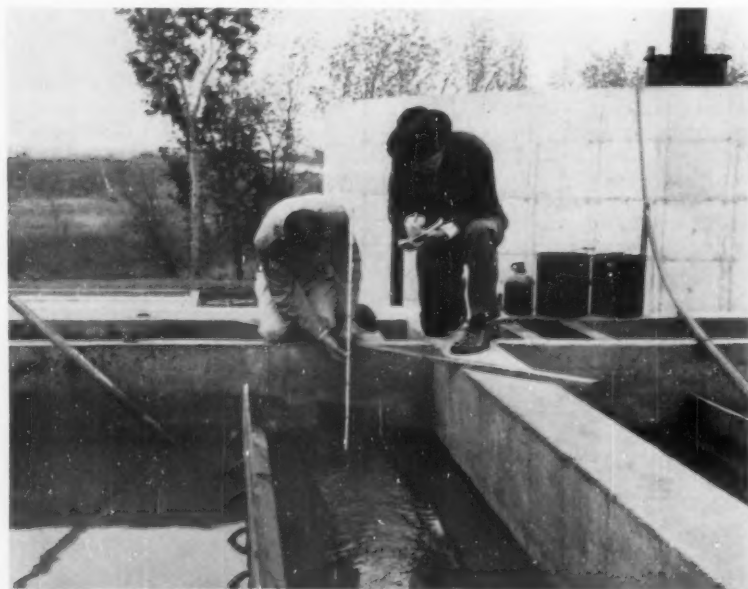
Public Works Facilities for Caterpillar's New Decatur Plant

A new plant for the manufacture of motor graders and wheel-type tractors has been completed at Decatur, Ill., by Caterpillar Tractor Co., on a 425-acre tract of land. The two main buildings provide 840,000 square feet of floor area and 3,200 persons are now employed there. In design and construction, provision was made for the necessary public works utilities. There is a parking lot, lighted and paved with black-top, which can handle 1,150 cars. Industrial wastes are treated by a plant which handles acids and alkalis, breaks down emulsions and removes solids. Storm drainage is controlled by ponding on the roof with the pond level controlled by overflow weirs, thus reducing the momentary peaks of runoff. A 300,000-gallon water tank gives a reserve for fire protection which provides water necessary for plant operation. Water, gas and sewage facilities are oversized approximately 50 percent in order to provide for future expansion.

• • •

Design Standards for Streets

For application to new sub-divisions, Longmont, Colo., has adopted street design standards. Major subdivision streets are recommended to have a minimum width of 100 feet; secondary streets, 70 feet; local collector streets, 60 feet and non-through local streets, 50 feet, with dead-end streets not to be more than 500 feet in length with a minimum outside radius of 50 feet at the closed end. Whenever possible, streets are to intersect at right angles, and where they meet at acute angles, a reasonable street corner radius is required.



● TO DETERMINE the dosage of insecticide needed for effective filter fly control, the sewage flow in channels leading to the filters was measured by gaging.



● CONVEYOR type loading attachment on one of the eight graders owned by the County speeds up the preparatory work.

ORGANIZATION and OPERATION OF A COUNTY HIGHWAY DEPARTMENT

PAUL HARTWIG

County Highway Commissioner
La Crosse County, Wisconsin

MEMBERS of our County Highway Committee are very conscious of the necessity for constructing and maintaining our highways and bridges with a high standard to meet present traffic demands, and to keep up with all the new and better methods in the construction and maintenance field. With this in mind we have established, we believe, an adequate highway program for La Crosse County.

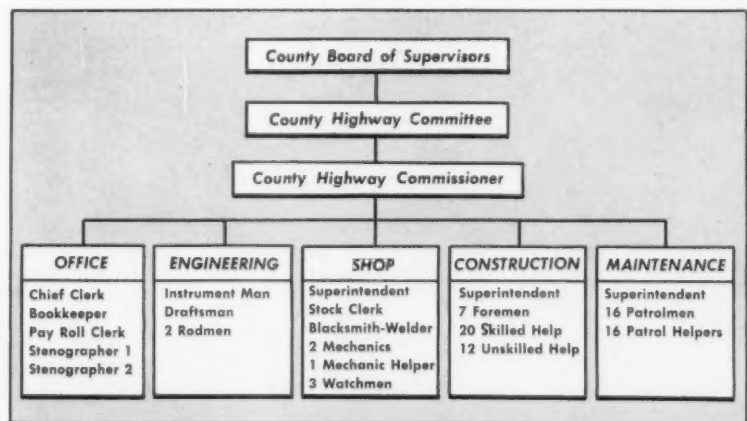
This county is located in western Wisconsin, the mighty Mississippi River forming a part of its western boundary. The rugged terrain features existing in La Crosse County has caused it to be referred to by many as "The Heart of the Coulee Region." The County is 481 square miles in area, has a population of nearly 70,000 people with its County seat in the city of La Crosse. A network of 841 miles of highways spans the County identified as follows: State and Federal Highways, 107 miles; County Trunk Highways, 292 miles; Town Roads and Streets, 442 miles.

The County Board of La Crosse County elects a five man Highway Committee and elects a Highway Commissioner to manage and supervise the Highway Department. These men are responsible for the fine organization that we have. The chairman of the Committee has held this office for over twenty years and the others have been on this Committee from five to fifteen years.

The main office of the Highway Department is located in the Court House at La Crosse. The main Highway Shop is located near West Salem

which is very nearly the geographical center of the County. Two small outlying storage buildings are located in the northwestern part of the County and a well equipped bituminous storage plant is located on a rail siding in West Salem.

The Engineering Section makes surveys, prepares plans and assists in figuring estimates for road and bridge construction projects. Only a few counties of the 71 in the State are fortunate enough to have an engineering section. We feel that an engineering section is a must, and



● CHART of Organization showing distribution of responsibility, LaCrosse Co.



● SURFACING procedure, showing typical job with travel plant mixing 60 percent red gravel, 40 percent sand and MC-3 asphalt. Compacted depth will be 3 ins.

believe the trend will be toward more departments adding engineering sections to their organizations in the near future.

The main highway shop is a new, modern, up-to-date structure constructed in 1949 at a cost of \$315,000. The shop is divided to provide storage for trucks and machinery and a repair shop. The repair shop is well equipped and includes a grease room, a paint room, a blacksmith shop, an overhead crane, a hoist and ample storage for repair parts, tires, batteries, etc. The shop is headed by a Shop Superintendent and operated by a crew of nine men consisting of a stock clerk, three mechanics, a blacksmith, a mechanic's helper and three watchmen-janitors. All trucks and machinery owned by the highway department are repaired and kept in good operating condition by the shop crew. In addition a good deal of repair work is done on Town-

ship owned maintenance machinery. There are seven other storage buildings at the main shop site for storage of equipment, steel, lumber, signs, dynamite and miscellaneous items such as cement, calcium chloride, etc. A large yard is available at the main shop site for storage of piling, culverts and some machinery.

The Highway Department operates with a total of 70 full time employees including administrative personnel. At the peak of the construction season this number increases to approximately 110 to 120 employees. The construction section is headed by the superintendent and each construction crew works under the direct supervision of a foreman and all types of construction work is performed, including grading, installing culverts, bituminous surfacing, installation of guard rail and construction of all types of bridges.

The maintenance section is headed

by the Maintenance Superintendent. In Wisconsin the counties perform all maintenance operations for the State on State and Federal highways on a reimbursement basis. The 107 miles of State and Federal highways are divided into five patrol sections and the 292 miles of County Trunk highways are divided into eleven patrol sections. Each patrol section is manned by two men referred to as patrolman and patrol helper. Each section is provided with a truck of approximately 2-ton capacity, a snow plow, a sand spreader and a two wheel pull-type grader. Also available are 11 tractor mowers which are rotated from one section to another as their need is required. The various maintenance operations performed are roadside cleanup, maintenance of drainage system including culverts and bridges, shoulder repairing, improving surface and base, maintenance of guard rail and filling joints on pavement. Winter maintenance operations include snow removal, snow fence erection and removal and ice control. Construction crews assist the maintenance crews a great deal during winter months when snow removal and ice control operations become so extensive that they cannot be handled promptly and efficiently by the maintenance crews alone. The driving public expects and demands good driving conditions all through the winter months, and in this north country with severe winters and rugged terrain this becomes a giant operation.

The following is a list of the larger and more important pieces of construction and maintenance equipment owned by the Department:



● SAND and gravel mix, using MC-3 on 9th Ave., Onalaska, showing appearance of completed 3½-in. thick pavement.

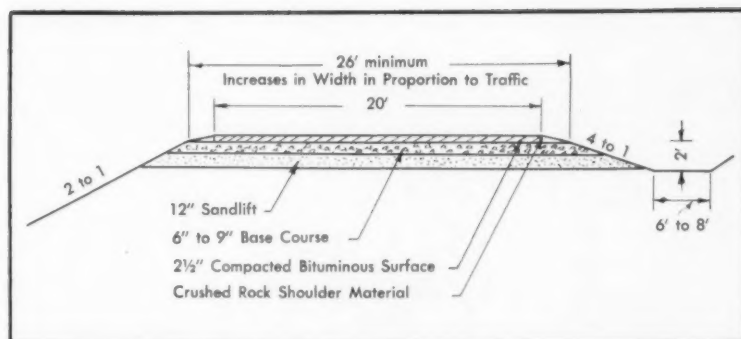
Sixty-two trucks ranging in size from ½-ton pickups to 8-ton, the 2-ton and 3- to 4-ton being the most in demand; twenty-five tractors, including seven crawler tractors and eighteen wheel type tractors; wheel-type tractors that include mowers and front-end loaders; eight motor graders, one equipped with a slope grader, one equipped with conveyor type loading attachment and six equipped with snow wings; two power shovels, one ¾ cubic yard capacity and one 1 cubic yard capacity; three bituminous distributors and three bituminous supply tanks; one bituminous travel plant; thirty-five snow plows ranging in size from small one-way plows to large V type plows; eighteen self-feeding sand spreaders; three scrapers, 12-cubic yard capacity; three air compressors; and four road rollers, along with various other equipment such as construction graders, trailers, cement mixers, conveyors, pile drivers, pumps, tool houses, power plants and a screening plant. The total valuation of this equipment is \$308,000.

Every two years the State Highway Commission provides counties with State and County traffic count maps. These maps are furnished at no cost to the counties and the State also provides additional traffic counts at desired locations. These traffic counts are important and necessary in planning a sound highway program.

We follow a policy of grading, installing a drainage system, and placing sand lift and base course entirely with our own crews and equipment, with County and Town monies only. The bituminous road mix surfacing and shouldering material is placed with County and Federal participation in the cost. We do the work with our crews and equipment under contract with the State.

We have the following miles of County Trunk Highways constructed to this high standard: 16.29 miles on Federal Aid Secondary System complete, 7.63 miles on Federal Aid Secondary System complete except for base course and bituminous surfacing, 30 miles off of the Federal Aid Secondary System complete and 10.10 miles off the Federal Aid Secondary System complete except for base course and bituminous surfacing. We have nine bridges on the Federal Aid Secondary System constructed by contracts.

In line with the President's proposed highway program, we have completed a sufficiency rating survey of our roads in order to determine our needs to bring our entire highway system up to modern standards.



● TYPICAL section used by LaCrosse County Highway Department for all Federal Aid Secondary and County Trunk Highway Construction. Pavement width is 20 feet.



● SCREENING and mixing sand and calcium chloride for ice control. The prepared mixture is shown discharging from the conveyor into the truck at the left.



● SAND lift is being placed. This is 12 ins. thick and extends from shoulder to shoulder. A base course, 6 to 9 inches thick, is then placed and surface added.

BRUSH CHIPPERS HANDLE CHRISTMAS TREES, ROADSIDE BRUSH and SLUDGE

ALBERT N. B. RAPP,

Plant Foreman,

Township Incinerator,

Abington, Pennsylvania

WHILE THE township incinerator may not be the first place one would think of where brush chippers can be used to advantage, that is one place where they are doing a big job for us. In June, 1955, our brand-new \$600,000 incinerator was put into operation to solve a refuse and garbage problem. All went well until Christmas-time when the Christmas tree cleanup put us over the proverbial barrel.

In need of help, I contacted Harold Gentile, Sales Manager of the Asplundh Chipper Company in nearby Jekintown. He suggested we use chippers to reduce our hauling problem. A demonstration convinced us of the advantages of these machines and we requisitioned two units at once. Residents were requested to place their trees by the curbs and our trucks and chippers went to work. From 12,500 homes we collected 7,500 trees, thus relieving that many homeowners of the danger of burning or of otherwise disposing of their trees and sparing their neighbors the bothersome smoke.

In this cleanup we found that a single truck could take from 450 to 500 trees before unloading—a tre-

mendous cost saving to us. Furthermore we were pleased to find that a number of residents came to our plant to obtain some of this chipped material for use in mulching their acid-loving plants such as rhododendron and laurel.

Others Like It Too

With the spring we found new cost-saving uses for our chippers—we, that is, jointly with other departments of the township. These machines came in handy for spring cleanup in our parks; they did a fast job on brush, fallen limbs and trimmed material. The highway department uses the chippers frequently to dispose of brush along the roads. That department, by the way, has completely eliminated hauling and burning of brush and uses these chippers solely. Also, we have found them indispensable in cleaning up debris after storms.

An unusual use to which these chippers have been put is for pulverizing the dried sludge from our sewage disposal plant. Residents of the area may take this material for use in their gardens; it makes an excellent soil conditioner and fertilizer. This service, needless to say, has additionally enhanced our relationship with the taxpayer.

We equip each chipper with two sets of blades, changing them whenever necessary to insure uninterrupted operation. Economical to run, this equipment uses only 10 gallons of gas per 8-hour day of continuous use.

The chippers have been a tremendous help to us; they have cut costs very substantially and have helped us to serve better the public interest. We consider them an excellent investment and they are also appreciated by our Board of Commissioners. They have been a wonderful help in cementing our public relations.



● CHRISTMAS tree disposal problem was solved by this brush chipper, but other year-round uses were also found for it.

OPPORTUNITIES

In Civil and Public Works Engineering

SALES ENGINEERING

THIRTY YEARS AGO engineers regarded the title "Sales Engineer" with coolness. The words "sales" and "engineers" were supposed to be contradictory. A sales engineer was often considered to lack the ability to be a "real engineer". Now, however, the sales engineer is regarded as essential in business and industry.

During my college career in civil engineering, I had not the slightest intention of becoming a sales engineer, although I had done selling during two summers. I needed money for my education; and I was told that in sales work one could accumulate a tidy sum in a short time providing one was willing to work hard. When I graduated, the country was in a depression. Companies were desperately looking for salesmen who could bring in business. I decided to join the ranks of the then very few sales engineers—but "only temporarily," I said to myself. I found sales engineering rich with opportunities and interesting problems. It was challenging work. It was just what I wanted.

Salesmanship is the sparkplug of progress. It is the liaison between areas of supply and areas of demand. When products or ideas are sold, the wheels of progress turn, jobs are created, money is spent, money goes into circulation, producing more money, more purchasing and more jobs; and the cycle repeats itself as long as selling is kept at a properly high level.

Salesmanship, especially that of the sales engineer, embraces the art of teaching others. It is not a classroom type of teaching; nevertheless it requires teaching people to understand a product or an idea. Good teaching requires good selling. The best class-room teacher is so rated largely because he does a good job of selling students on his subject. Not only must he know his subject; he must be enthusiastic about it in a way that will arouse class interest. In addition, he must be able to make others understand his points.



J. P. LAWLOR,
President, General Filter Company
Mayor of Ames, Iowa

These are the fundamentals of salesmanship.

Does a degree in civil engineering qualify one for sales engineering? No, but it is a great help. The civil engineer has acquired an excellent basic training on which to build a successful career as a sales engineer.

There are two principal kinds of equipment to be sold, pre-engineered and custom engineered. Pre-engineered equipment include items on which all the engineering and design work is carefully done before the product is manufactured. This includes such equipment as water meters, tractors, earth-moving equipment and electric motors. Custom-engineered products include items which are partly pre-engineered and partly engineered by the sales engineer during the process of selling. These include such items as large water-conditioning plants, special pumping machinery, automation equipment, and central-air-conditioning systems.

Is a large amount of travel necessary? That depends on the product being sold. If sales are confined to a large city area, the sales engineer is home almost every evening. If the territory covers a 100-mile radius, he is home about 60 percent

of the evenings. If it is national or international in scope, his time away from home may vary from a few days to a few weeks at a time.

Preparation and Training

In the preparation for sales engineering, certain basic subjects are important, such as engineering, economics, business law, contracts and specifications, public speaking, public relations and journalism. A curriculum in civil engineering contains many courses that are generally useful regardless of the particular type of product the sales engineer may be selling. A knowledge of such fundamental subjects as mathematics, surveying, drafting, sanitation, hydraulics and electricity is needed in nearly every branch of sales-engineering work. Some knowledge of the principles of economics is important in proving to the purchaser the value of a product. A knowledge of business law is an aid in understanding fundamental elements of American business such as partnership, corporations, legal and illegal business methods and taxation. Skill in public speaking is essential for a sales engineer. Self-confidence before others is a necessity. A course in public relations develops ability to get along with people, to understand them better and to make others understand what he and his firm are doing to make this a better world. The sales engineer should be civic minded and render services to his community. There are many ways to acquire those important qualities that do so much to create confidence—and confidence is basic in every good sale.

Personal qualifications are important in almost any type of work; but in no calling, professional or otherwise, are certain personal qualifications so important as in sales engineering. Condensing them in a couple of words we could call them "sales ability". Analyzing sales ability, we will find a list of characteristics like: thrill of achievement;

confidence; perspective; pleasing personality; optimism; persistence; originality; resourcefulness; tact; spiritual development; native intelligence; and love of conquest. The same qualities are essential to a good business executive.

I have been asked, "What engineering ability is required to supplement selling ability?" An engineering knowledge of the product being sold is most important. Supplementing that are engineering perspective and analytical ability. Class work develops engineering perspective; some men have a natural abundance of it, but most acquire it only after years of good engineering experience. Analytical ability grows in the same way.

How to Get Started

The question is sometimes asked, "What should I do to get started in the field of selling?" There are several ways. The best school of basic training is experience. Use your vacations or other spare time to practice salesmanship. Selling any kind of a legitimate product or idea is valuable experience. At the same time, ponder over the conversations you had, the characteristics of your prospects, the reactions to your presentation, the reasons you failed or succeeded. Don't expect anyone to buy unless you have first succeeded in creating, and maintaining, an atmosphere acceptable to the customer.

Learning to sell is like learning to swim. You must get into the water and start paddling. If you are a beginner, getting started in the first selling job seems difficult, but it isn't.

After basic training in sales engineering, which you should go out and acquire yourself, and after receiving your degree in civil engineering, you land a job with a company that handles the product or ideas you wish to sell. Don't ask for, or expect, to be placed on the sales force at once. Take any kind of work offered you. Once you join the ranks, if you have what it takes to sell, you will soon find that there is nothing to keep you from getting into the sales department. No profit-making organization can exist without good salesmen. First learn all about its products and personnel and sell yourself to the organization. You will soon be on the sales force, in a position clearly to demonstrate your ability.

How To Progress

Attaining the profession of sales engineering does indicate a sure

degree of success. Ahead lies the salesman's field, rich with golden opportunities for the sales engineer who is willing to work hard, and enjoys doing it. Perhaps there is no field in which it is more important to keep up with the times. The salesman must keep informed on many things, especially new products in his own field. He must also keep abreast of current events in the world of business, science, entertainment and human relations; directly, or indirectly, they all contribute to progress through better selling.

Essential to progress as a sales engineer is knowledge of many subjects related to business. Two busi-

ness fields especially close to sales engineering are public relations and national advertising. They are inter-related and familiarity with them is the foundation of a good sales force.

good sales engineer and the monetary return bears a direct relationship to the law of supply and demand. Company progress, in the final analysis, depends on successful selling of company products. The field of good sales engineering never has been and never will be crowded; and a sales engineer often develops into a top-flight, top-salaried business executive. The soundest social security one can attain is a well developed ability to sell ideas to others. There, too, is the psychic income in addition to dollar income. One source of psychic income for the salesman is his feeling of being necessary. When a person no longer feels that others need him, he has

Joseph P. Lawlor was born on a farm in Eastern Iowa. He received his degree in Civil Engineering from the University of Illinois. In World War I he was a Captain of Infantry, U. S. Army; in World War II, a Commander in the Civil Engineer Corps of the Navy. He spent 13 years as Sales Engineer with Layne and Bowler, Inc., and affiliated companies including Layne Central Company and Layne Chicago Company. In the Layne organization he also held the offices of Secretary-Treasurer, Chief Engineer and General Manager. He served as Assistant Professor in Civil Engineering at Iowa State College for one year.

In 1935 he organized the General Filter Company, a water conditioning organization, and has been its President since that time. He served several terms as City Councilman of Ames, Iowa, and is now in his second term as Mayor of that city. Currently he is also President of the League of Iowa Municipalities and the Iowa Taxpayers Association, and is State Chairman of the Hoover Report Committee. He is a member of ASCE, AWWA and the Iowa Engineering Society; and is a registered Professional Engineer in several states.

ness fields especially close to sales engineering are public relations and national advertising. They are inter-related and familiarity with them is the foundation of a good sales force.

A sales engineer is in an excellent spot to gain advancement. He is in the position where management can easily recognize his worth because it adds up on the record in dollars. Hence, the salesman who deserves promotion is most likely to get it; he is not lost in the crowd. Among the various occupations in an organization, the salesman can count most on performance, not politicking—on sales, not seniority—on record, not relationship. In addition to promotion in the sales department he can take advantage of opportunities to develop his future in management.

The Rewards in Service and Money

In sales engineering one is likely to get paid according to results produced because it is easier for all to see the results of his efforts. There is always a demand for a

an empty existence. Buyers actually need the salesmen; they count on him and recognize him as an advisor. The thrill of achievement that comes from good selling provides psychic income. A good salesman is an expert in analyzing the problems of the prospect, and when he turns a prospect into a customer he has cause to rejoice.

Self-respect is wanted by all people. A salesman has it because his activity is essential to our economy. Nothing much happens in the world of human relations until someone sells something. Every sale moves money, creates jobs, makes more purchases possible, makes more people happy. A sales engineer's calling is one of pride and dignity. The activity of selling is not a profession, but a sales engineer is a professional man and has professional relations with his buyers. Community respect is an essential to good living. A successful sales engineer makes money, and has the intelligence and the ability to live happily among others. He is respected as a top citizen in the best communities.

OPPORTUNITIES

In Civil and Public Works Engineering

E. SHERMAN CHASE

Partner, Metcalf & Eddy,

Consulting Engineers,

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THE CONSULTING ENGINEER

FEW CAREERS offer the variety of experience as does that of Consulting Engineering. Accompanying this variety of experience is a variety of problems. The problems encountered and the experience gained depend in part upon the field of practice and the years spent therein. Consequently, the views expressed in this article are, of necessity, the result of the author's own experience.

In the first place, how does one get started as a consulting engineer? There is no one method. In the firm of which the author is a member, each of the current partners started as an employee. This is probably the most common type of start. Years ago when trained engineers were less numerous than now, young engineering graduates, after a few years as employees of older engineers, would set up their own consulting offices. Others have begun private practice after serving municipal, state, or federal departments. Whatever the manner of start, it has usually required courage and self-assurance for a young man to leave a job of reasonable security for the uncertainties of private practice.

The professional activities of a consulting engineer usually fall under two broad classifications. First, purely consulting services, including investigations, reports, and ex-

pert testimony; and second, preparation of design and supervision of construction and operation of engineering projects.

Investigations and reports may involve field surveys, surface and subsurface explorations and, in many instances, preliminary plans with cost estimates and financial programs. Some problems may require extensive library research or even laboratory and pilot plant research. The preparation of the report itself calls for skill in the art of communication to the client or to the public.

To qualify for expert testimony, the engineer must have appropriate education, much experience, and unblemished reputation. In addition—and this is of great importance—the expert must possess personal qualifications which ensure that his testimony will carry weight: an air of confidence without aggressiveness, and a likable personality without unctuousness.

Design and Construction

The consulting office undertaking the design of a project must first establish the basic data therefor, preparatory to the functional layout. Once the basic data and general layout are decided upon, the detailed design follows. Such detailed design may involve either a few or many specialized fields of

engineering. Designs of water purification plants or sewage treatment plants, for example, will involve hydraulic, structural, mechanical, electrical and architectural engineering. The selection of equipment and the preparation of specifications must accompany the work of designing.

The consulting engineer will prepare contract documents, assist in the receipt of bids and their analysis and will make recommendation with respect to the award of contracts. During construction, the engineer will usually provide general supervision of construction, resident inspection and review of shop drawings; he will also interpret specifications, settle disputes, and make monthly and final estimates for payments to contractors.

Following completion of the project, the engineer may be called upon for consulting or resident supervision of operation, not only during tuning-up, but also for a period of time thereafter. If the project is one financed by revenue bonds, the consulting engineer will often be retained to carry out specific duties designed to safeguard the investment.

The performance of engineering services for clients is but one phase of the operation of the consulting engineer's office. Obviously no consulting organization can exist un-

less it has clients to provide the fees necessary to carry on the business. One of the real problems of a consulting engineer is how to maintain a steady volume of business activity. The older engineering offices usually have acquired over the years many satisfied clients who come back again and again for services. The young engineers, however, have no such backlog of clients and consequently find the early years of independent practice somewhat difficult.

Ethical considerations limit the methods whereby new business can be obtained. The young engineer, by attending technical meetings, can frequently make acquaintances through whom work will come. He can establish a reputation for ability by presenting technical papers of merit and by participating in discussions and committee work. He can make calls where engineering works are projected, and thus make known his availability for an engagement. It must be re-emphasized here that the getting of a job is often dependent upon personality and the skill with which the engineer can demonstrate his qualifications.

Management and Business

The young engineer often has little conception of the management and business side of a consulting engineering organization. His formal education, unless he takes a course in engineering management, provides him with little forewarning of the problems involved in the operation of a business, even though that business is the practice of professional engineering. Whether the consulting engineer's office is large or small, books must be kept and bills rendered. Some knowledge of business law is essential, particularly in regard to contracts. Proper and adequate time records must be kept, payrolls and other obligations must be met on time. Bank credit must be established so that loans may be arranged when necessary. Knowledge of tax liabilities is essential. Laws with respect to hours of employment and overtime payments have to be kept in mind. Insurance of various kinds must be carried, varying with the different states. If Governmental defense work is undertaken, the security clearance of personnel is required.

The physical setup of an engineering office involves the purchasing of equipment and supplies. Office quarters, layouts, leases and locations are all matters which the

engineer must consider. Personnel relations, vacations, sick leaves, promotions and raises, hiring and firing, are typical of nontechnical matters which require wise and patient consideration.

The organization of an engineer's office is a matter of prime importance if it is to operate efficiently. This is true not only as regards its physical layout, but also in respect to the coordination of personnel. The keeping and maintenance of quickly available files of correspondence, computations, technical data, plans

proper English his observations, conclusions and recommendations. Another personal qualification, which must be stressed is the ability to get along with older people. Some time ago, one of the national magazines published the result of a survey of employers regarding their reasons for discharging employees. This showed that by far the most common cause of discharge was the inability of the employee to get along with his fellow workers. It may be briefly stated that the three cardinal

E. Sherman Chase graduated from Massachusetts Institute of Technology in sanitary engineering. After graduation he worked as a chemist and bacteriologist and as a resident engineer at a sewage treatment plant. In 1913 he went to work for the Borough of Richmond, New York City, as an expert on sewage disposal. One year later he became a sanitary engineer for the New York State Department of Health. He joined Metcalf & Eddy in 1920 as a sanitary engineer and has been a partner of the firm from 1927 to date.

Mr. Chase is a member of American Institute of Consulting Engineers, American Society of Civil Engineers, Boston Society of Civil Engineers, American Water Works Association, the New England Water Works Association, Federation of Sewage and Industrial Wastes Associations, Chi Epsilon and Delta Omega, and is an honorary member of Institution of Water Engineers (England). Author of numerous papers on sanitary engineering subjects, his practice has included a wide range of sanitary problems for many municipalities and industries throughout the United States. He has been an expert witness in numerous cases involving stream pollution and water diversion.

and specifications, and books and catalogs is not the least of the problems in running an engineering office.

The young engineer entering an engineering office should possess, in addition to a technical education, certain manual skills, such as ability to make an accurate survey or to turn out an acceptable drawing. Such abilities will make him immediately useful to his employer. This dictum is perhaps unpopular in academic circles, but is based on many years of experience and observation.

Obviously, if manual skill is the only qualification a young engineer possesses, he will always remain a draftsman or a surveyor; so, in addition to manual skill, the young engineer should possess the ability to think; he must be able to formulate a problem, collect and arrange the essential facts and data, and reach a logical solution of the problem.

Manual and mental abilities, however, are not enough. A good engineer who is to succeed in his profession must have intellectual integrity, possess common sense, and have, above all, the ability to communicate in clear, concise, and

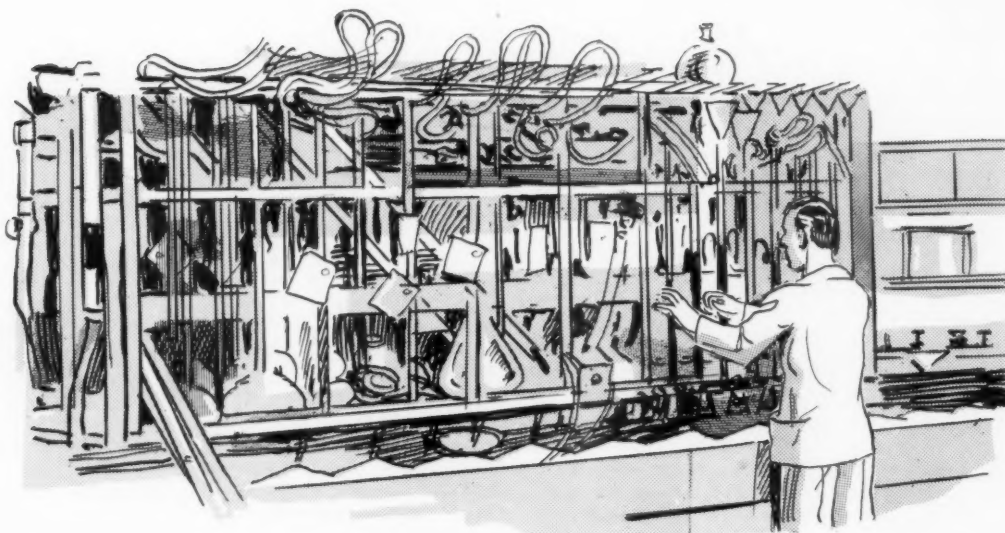
courses of conduct, or the three "C's" for success, are Capability, Communicability and Compatibility.

What are the rewards of a Consulting Engineer? Some rewards are tangible, others are intangible. Financial rewards may be meager, ample or, on occasion, generous. Few practicing engineers acquire substantial riches through their professional practice alone. One intangible reward which comes to the professional engineer, particularly to one engaged in consulting work, is the friends he makes in his profession and among his clients. No better advice can be offered a young engineer than to cultivate the art of sincere friendship, for through human contacts come breadth of vision and wisdom, qualities not acquired from textbooks.

Perhaps it is in the intangible satisfaction of adding something to the well-being of mankind that the engineer is most richly rewarded. It is particularly gratifying to the sanitary engineer, for instance, to realize that he has contributed much towards the eradication of typhoid, yellow fever, and other deadly infectious diseases.

OPPORTUNITIES

In Civil and Public Works Engineering



RESEARCH

GERARD A. ROHLICH

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RESearch has been defined as a state of mind, and while it is true that research has different meanings to different people, engineering research is usually applied research in that the efforts of the worker are directed toward obtaining results which will have some practical application.

Research has long been recognized by industry as a vital force in maintaining a position of leadership. Since World War II, research has taken on increasing importance in both government and industry, and current yearly expenditures for research are in excess of five billion dollars. Research is a new kind of frontier for those who are inclined to explore and who have a strong desire to learn more as to "why" and "how" the forces of nature behave and can be controlled for the advancement of mankind. It has been aptly stated that in research "it is not so much what a man knows, but what he can learn."

From these generalizations it is evident that the research worker in any field of engineering must have a strong interest in the basic sciences. Equally important is the fact that he must be adept at communicating with others. This means that he must be able to present his findings in both written and oral form clearly and leave no room for misunderstanding. Each of the branches of civil engineering is different and an individual's interest in any one branch may not be evident until he has had the opportunity to sample all of the fields. Regardless of which specialty finally attracts him, however, it is important to note that mathematics, physics and chemistry are basic requirements. Mathematics is the most useful tool that the research man has at his command. Without a thorough understanding of mathematics, through the calculus and differential equations, and an appreciation of statistical methods, the engineer in research will find that his capacity to learn and understand will be limited. He will find many future paths closed or complex.

Of equal importance is the subject of physics. In particular the

civil engineer must possess a thorough understanding of the mechanics of both solids and fluids. This understanding provides the basis on which the engineer can learn and understand the effects of both stationary and moving forces on bodies at rest and in motion. Knowing how such forces act and react and why solids and fluids behave as they do when subjected to external and internal forces forms the foundation on which can be built the superstructure of applied research and development, particularly in the fields of structures and hydraulics.

The nature of materials, their composition, how they may be altered and the relation between their physical and chemical properties demands, of the civil engineer in research, an interest and understanding of chemistry. Those interested in sanitary engineering research must, of course, lean heavily on chemistry if an understanding of water and sewage treatment processes is to be had, and if new and improved processes are to be developed.

Thus at the high school level the young man or woman who thinks engineering research may be a

likely career would do well to strengthen his or her program in the basic sciences. At the college level the best preparation for a research career in civil engineering would be to obtain as a first step the Bachelor of Science degree in civil engineering. The regular curriculum provides the student with the necessary background of fundamental course work and at the same time, through a series of specialized courses, provides an introduction to the various fields in civil engineering. Most universities and colleges have room for elective courses in their curricula, or offer options in specialized branches. In the event that the student's interest in any particular branch has been stimulated, he may through the selection of an option, or by judicious use of his elective courses, strengthen his program by including additional work in the engineering sciences. Faculty advisors are always available to help in the selection of those courses which will prove most useful in preparing the student for his future work.

History offers a continuous record of the engineer's ability in creative design. But of equal importance is the fact that the creative design, developed from fundamental principles, is practical and becomes a useful structure. Among the personal qualities that the research engineer must possess in large measure is intellectual curiosity. His desire to learn more must give him personal satisfaction and be an enjoyable experience. This desire to learn and its subsequent fulfillment continues to enrich the storehouse of information that the research engineer possesses and broadens his vision, thus permitting him to draw from his background information and techniques that will aid in visualizing the logical steps in the development of a project.

Some people have the mistaken concept that a research worker is a "lone wolf" puttering away in a laboratory and suddenly striking upon a startling discovery. Such a concept is far from actuality. Teamwork in engineering research is vital to successful accomplishment and individual discovery is a rare occurrence. To be successful the research worker must be a sociable person, able to get along with others with ease, and be comfortable in his associations, not only with those with whom he works and exchanges ideas, but also with

those who are to make use of his findings. His social consciousness extends beyond the individual contacts that he makes since he realizes that his work frequently has broad social implications. This is particularly so in civil engineering research since new developments in this field of engineering are generally concerned with public works and must gain public acceptance if their full usefulness is to be realized.

In a sense almost every major civil engineering project has an element of research in its conception, design and construction. Unlike other branches of engineering in which frequently the goal is mass production of a consistently uniform product, most major civil engineering projects are custom built. They are designed and constructed to fulfill a particular need in a particular location. A notable exception to this, of course, is in airplane production in which the structural engineer plays an important role. This is a field in which the stress analyst will find research opportunity and in which there is a large demand for civil engineers.

In the atomic energy field, problems in selecting plant sites, in planning urban areas in relation to atomic development and in the design of special structures and facilities are subjects on which additional study and research are taking place. Improvement in methods for the treatment and disposal of radioactive wastes and for the purification of water containing radioactive materials are under investigation by governmental agencies, industries and universities.

In the transportation field, civil engineers are actively engaged in developing improved highway design to accelerate traffic movement, improving surfacing materials and

investigating design of airports and heliports. Electronic surveying, aerial surveys, developments in photogrammetry and other projects in surveying and mapping are samples of the activity in this branch.

Structural engineers are finding new approaches in the analysis and design of prestressed concrete, learning more about effects of vibration on structures and continually critically reviewing analytical methods and theories used in structural design. In the field of fluid mechanics, hydraulic engineering, and hydrology, work continues on such projects as energy losses in flowing fluids, problems in open channel flow, model theory, sediment transport and vortex flow.

Improved methods and new methods for industrial waste treatment, studies on corrosion, research on water treatment, and problems in environmental sanitation are some of the problems of interest to sanitary engineers.

It is not unusual for those interested in research in civil engineering to gain experience after graduation and then return to school to obtain post-graduate training. This often proves to be of unusual value since practical experience broadens the outlook of the student and the subject material in advanced courses has greater meaning.

Financial rewards, as salary, for research workers is comparable with other positions in civil engineering; but by far the greatest reward is the satisfaction that the worker receives in realizing that his work may aid in solving a difficult problem at the same time that he is fulfilling his desire to learn. The research environment is a pleasant one. There may be many and long hours of hard work, but there is never a deadening routine.

Gerard A. Rohlich, Professor of Civil Engineering at the University of Wisconsin, is a graduate of the Cooper Union Night School of Engineering in 1934 and also holds BS, MS and PhD degrees from the University of Wisconsin. His graduate work was in the specialized field of hydraulic and sanitary engineering with minor work in bacteriology and chemistry. His previous teaching experience was at Carnegie Institute of Technology and Pennsylvania State University. During World War II he served as a sanitary engineer in the office of the Chief of Engineers, War Department, and is now a reserve officer in the Public Health Service. His name is listed in "Who's Who in Engineering" and "American Men of Science," and he is the author of numerous publications in the field of sanitary engineering.

A registered Professional Engineer, he has served as consulting engineer on municipal and industrial waste treatment problems. He is a member of the Research Committee of the FSIWA and a member of the Sanitary Engineering and Occupational Health Study Section on the National Institute of Health Division of Research Grants. In 1955 he and two co-workers received the FSIWA Harrison Prescott Eddy medal for outstanding research.

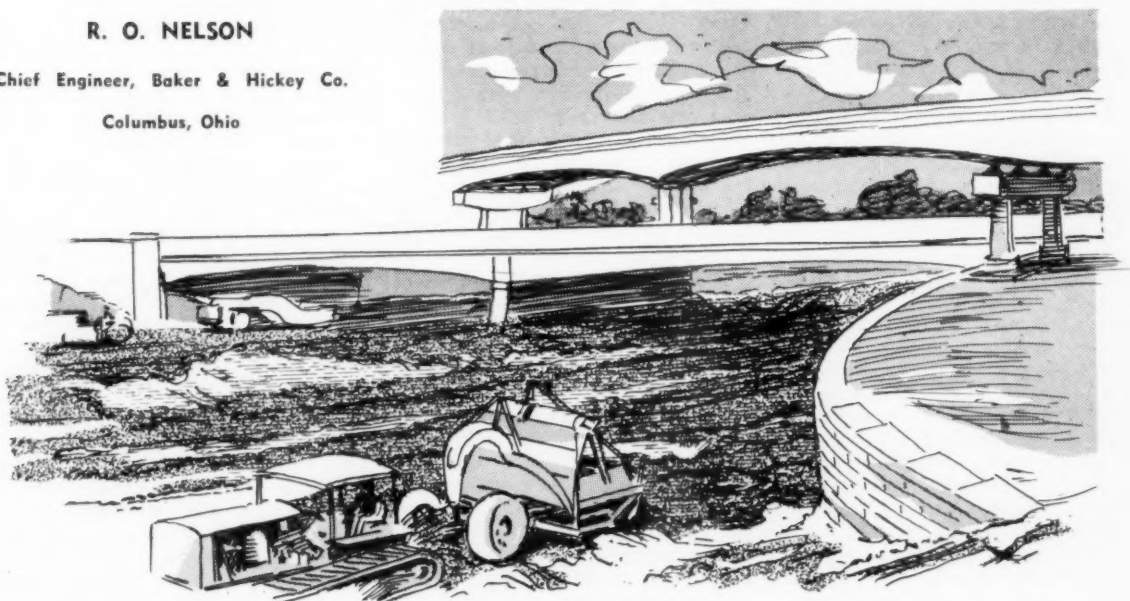
OPPORTUNITIES

In Civil and Public Works Engineering

R. O. NELSON

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CONSTRUCTION AND CONTRACTING

ENGINEERS have been employed by large contracting companies for many years. These companies often combine engineering design activity with construction operations to produce for the client or customer a complete facility or structure. The engineers employed by such organizations are specialists in a particular field, such as designers, estimators, erection and special installation experts, mechanical and electrical men. The construction industry is so diversified that the employment opportunity for engineers is very great.

Civil engineers are employed by these companies in many ways. They obtain preliminary survey information relative to site topography, availability and location of sewer, water, gas and other utilities and location of property lines. In the design section engineers study, evaluate and prepare plans for production line facilities and manufacturing procedures, including roadways, parking facilities, drainage structures and similar work.

In addition to the regular design

section, all large contracting companies employ estimating engineers to make quantity surveys, establish cost record data and prepare estimates of cost for bidding purposes. Engineers are needed also for planning job procedure and progress studies, for the preparation and checking of current progress pay estimates and for the actual layout work in the field.

Contractors specializing in highway grading and paving and in railroad construction employ engineers to prepare mass diagrams for earth moving operations and material hauling information. Contractors specializing in bridges, heavy foundations and hydraulic structures need engineers to design and prepare plans for formwork for reinforced concrete, temporary supporting falsework and shoring, and cofferdam installations.

Small contracting companies, too, have seen the need for and realized the importance of utilizing engineering talent in their organizations. An engineer who can perform the duties necessary in the more limited scope

of activity of these smaller contracting companies has almost limitless opportunity for employment. The contracting business has become so competitive that, in order to survive, every effort must be made to plan the work wisely and thoroughly; equipment and materials must be used to the best advantage; and man hours of labor must be reduced as much as possible.

Opportunities for employment in construction-contracting will continue to be numerous because of the tremendous backlog of highway construction work yet to be done. Continued industrial expansion will require much new construction. Atomic power development is in its infancy. The national defense needs will call for continuing construction activity. Flood protection and river development will contribute its share of projects.

Young men contemplating a career in civil engineering with a special interest in construction-contracting should complete a general engineering course, majoring in

civil engineering with as much supplementary class work as possible in business methods, general accounting and banking. Some universities have courses designed to give a civil engineering student information on contracting practices and problems. Inquiry directed to a contractors' association in a particular state may provide information along this line.

However, the young man contemplating such a career should first satisfy himself that he is physically and temperamentally constituted to engage in this phase of civil engineering. He will be called upon to perform work that may require irregular working hours in adverse weather conditions. He should be able physically to perform the work which may require working in rugged terrain, walking on structural members and engaging in sometimes strenuous construction work. If he likes to see things transformed from a designer's concept to a completed structure and if he is not afraid to tramp through dust and mud and battle the elements, then, and only then, should he consider this phase of civil engineering.

One other aspect that must be considered is the matter of home life. Since projects generally are in widely scattered locations, this must be given serious thought. If a permanent home location is decided upon, the engineer must be able and willing to remain away from his family for considerable periods of time. If the family is to be together, there is the matter of frequent changes of schools for the children, making new contacts and friends at more or less frequent intervals, and living in quarters that may not be equal to those which the family would desire. These are a few of the items that require appraisal.

Upon completion of his academic work the young engineer must choose the particular field in which he wishes to engage. Some experience in plan preparation, in design and in contract administration will be a decided help when a connection is made with a contracting organization. This experience can best be obtained by working for the engineering section of a city, county or state, the Bureau of Public Roads or a consulting engineering firm. If experience can be obtained somewhere along the way by actually working in a trade group, it will afford an opportunity to learn first hand the view point and philosophy of the workmen; something

that will prove extremely beneficial later on.

Early in his career the young engineer should not be afraid to change jobs, if by doing so he can observe how several contractors handle their work and thus learn to evaluate methods and ideas of others. He should not stay in the employ of a contractor who is not willing to explain the merits of various methods, techniques and processes. He should not be afraid to ask questions and should not be content until each question has received a satisfactory answer.

The engineer engaged in the contracting phase of civil engineering will be associated with other professional men and with business people in general; and in addition he will be called upon to work with skilled and unskilled workmen of varying degrees of education and culture. He cannot be a snob and still be successful. He must be willing to help any and all who may call upon him for advice and service. If he enjoys working with these people it will make the work more pleasant and those he helps will reciprocate by a measure of co-operation obtained in no other way. The application of the philosophy of walking the "second mile" pays rich dividends here as in all pursuits. He must learn how to give orders. He must learn to be attentive and thorough in carrying out assignments; to approach his problem with an open mind and from as many different angles as possible; to study as much source material as is available; and to call upon his imagination to the fullest possible extent.

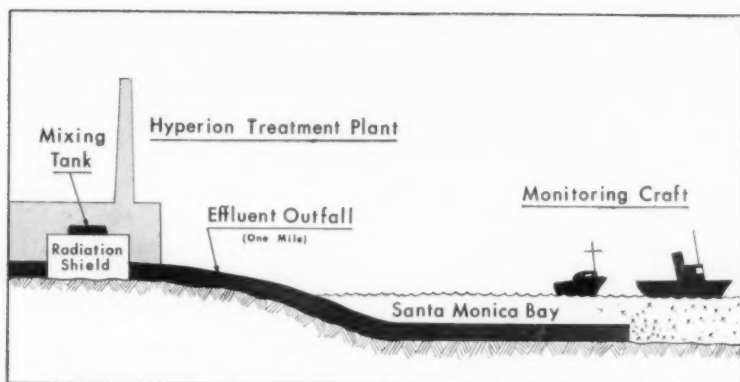
What rewards accrue to the engineer who makes a career in the construction-contracting field? From the monetary viewpoint they compare favorably with almost any phase of civil engineering and ex-

ceed that paid by many. As a general rule, the ability of an engineer well qualified for work in the construction-contracting field is more readily recognized and, consequently, he is more adequately reimbursed than are civil engineers employed in many other fields.

The opportunities for allied assignments are many. Construction engineers are often selected to be project managers or chosen for executive positions of various kinds. Such assignments usually have a supplemental pay schedule which is based on a percentage of job earnings. These, of course, are used as an incentive to produce greater job profits for the company, yet they afford an excellent opportunity to increase the employee's remuneration. Many engineers, after having accumulated sufficient knowledge and experience, pass from the employee class to their own business.

There are many rewards other than those having monetary value. These rewards accrue to the engineering employee as well as to the contractor. To have been a part of an organization that has brought together the skill of management, engineering "know how", materials, and the combined effort of many different kinds of human endeavor, be it skilled or that of the most humble type, is reward in itself. This pride of accomplishment is a definite reward. The knowledge that problems have been solved, that circumstances and conditions which seemed insurmountable have been taken in stride, that the goal has been reached in spite of adverse weather and capricious nature; all of these give an engineer a feeling of satisfaction that surely must be classified as reward. He has the reward of viewing the completed project, knowing full well that he has had a definite share in its completion.

R. O. Nelson graduated from the University of Illinois with a BS in Civil Engineering with a major in structural engineering. After graduation he worked for the City of Aurora, Illinois, and after that took employment with The Standish Engineering Corp. in Chicago. In this work he was engaged in numerous phases of construction activity. Following this he was with the Ohio Department of Highways, starting as a bridge engineer in one of the division offices and later being transferred to the central office at Columbus. At the time of separation from state employment, in 1945, he was serving as Chief Engineer of the Construction Bureau. During the next few years he operated his own construction business. In 1948 Mr. Nelson became associated with The Baker and Hickey Co. of Columbus, Ohio, general contractors specializing in heavy construction, and is now serving as project manager and chief engineer of the Company's activities. He is a registered professional engineer in Ohio and member of Theta Tau and Chi Epsilon Engineering Fraternities as well as the NSPE, OSPE, and the Columbus Engineers' Club.



RADIOACTIVE TRACERS

Check Dispersion of Sewage Effluent

RADIOACTIVE ISOTOPES were used for the first time to trace the dispersion of sewage effluent in ocean waters, according to a report from Hyperion Engineers, the organization now designing more than \$40 million worth of additions and improvements for Los Angeles' sewerage system and the Hyperion Treatment plant.

This unusual application is part of oceanographic studies designed to insure against beach pollution when the modified plant, with its increased flow of sewage, is placed into operation. The experiment had the approval of the U. S. Public Health Service and Atomic Energy officials as well as State and Local health authorities. Radioactivity in the effluent, even at the point of introduction into bay waters, was computed to be substantially less than the concentration permitted for drinking water, as established by the National Bureau of Standards.

Hyperion Engineers is a joint venture organization of three local engineering firms participating in the designs under contract with the Los Angeles Board of Public Works. They are: Holmes & Narver, Inc., Daniel, Mann, Johnson & Mendenhall; and Koebig & Koebig. The actual nuclear tracer experiment was conducted jointly by Hyperion Engineers, Nuclear Science & Engineering Corp. of Pittsburgh, Pa., Hyperion Plant personnel and the Hancock Foundation of the University of Southern California.

During the recent test, introduction of the radioactive material—Scandium-46—was handled by NSEC technicians who were also charged with the procurement and shipment of the tracer. It was mixed

with effluent from the Hyperion Plant and discharged into the sea through the existing outfall. Scientists aboard a laboratory ship took radioactive measurements at various depths and positions to determine dilution and rate and direction of diffusion. This phase covered a full day and an area of 25 square miles.

Hyperion Engineers, in cooperation with Hyperion Plant personnel, provided equipment necessary

for the experiment. This included a shielded tank with agitator, flow meter, valves and controls, so that the proportions of Scandium-46 and sewage effluent remain constant throughout the one-hour period of introduction.

Selection of Scandium-46 was made after a thorough search for a suitable tracer. In all, some 21 substances were studied. Scandium-46 was deemed ideal since it meets all requirements for radiological health standards, has a short half-life, and its cost is not prohibitive. The twenty curies required for the experiment were obtained from the Oak Ridge National Laboratory and shipped in five separate containers, each weighing about 250 pounds and containing four curies of Scandium-46 in about 25 milliliters (less than one ounce) of hydrochloric acid, indicating that practically all the shipping weight is shielding material.

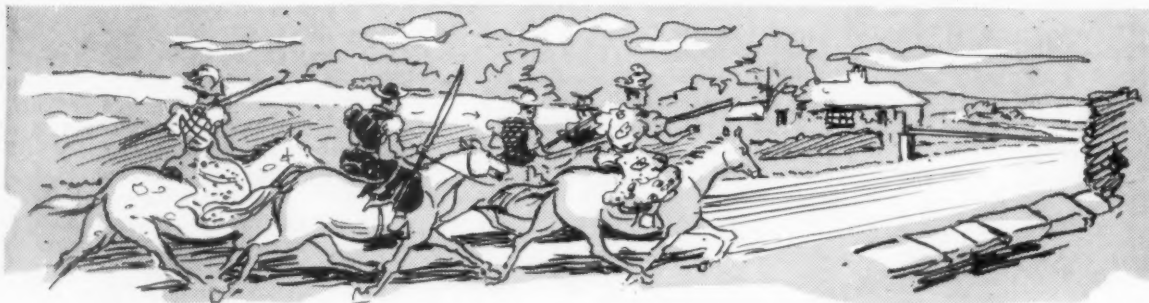
Prior to the actual experiment one "dry run" was conducted, using lanthanum chloride, an inactive substance, in place of the Scandium. Also before the actual test the system was preconditioned to keep absorption of the radioactive materials to a minimum. The test was run between the hours of 7 and 9 a.m. when effluent from the Hyperion plant is discharged at a minimum rate of about 5 million gallons per hour.

Clay Pipe Used To Drain Toe of Dam

AN EARTHEN DAM is being erected at the San Gabriel River Improvement, Whittier Narrows Flood Control Basin, in the Los Angeles Drainage Area, California. Over 19,000 feet of large diameter vitrified clay pipe will serve as a drain in the toe of the dam. Every 50 feet across the toe, 20-ft.

long collection lines of 6-inch perforated clay pipe are being laid. These lines are designed to pick up the seepage water collected by laterals laid in a pervious backfill and carry it to the main trunk line which removes it completely. As a result, the body of the dam is kept dry and stable.





WILL THE REBECCAS RIDE AGAIN?

History records many outbursts of opposition to toll roads. Though public protest today turns to less violent and direct methods than those used by our forefathers, the reaction of highway users should be considered by present-day planners.

WILL THE construction of the many miles of new toll roads in this country arouse a new version of the "Reberras" who tore down toll gates and raided toll houses in England 120 years ago because they resented paying a fee to travel on their highways?

In the late 1830s, farmers in the West of England disguised themselves in women's clothing and rode around the country at night tearing down the toll houses on the new toll roads. They were called the Reberras and their depredations were quelled only by troops. For hundreds of years, their ancestors had been accustomed to ride or walk free on the King's Highway so they objected violently to paying for this cherished privilege.

With the passing of the old turbulent order of the Middle Ages, peace settled on the countryside. This brought private carriages and public stage coaches out on the highways which were little more than muddy paths except for the few roads which had come down from Roman times. This new traffic required all-weather, surfaced and wide highways. But because of the difficulty of compelling persons living along the roads to pay for their improvement and because of lack of funds in the national treasury, Parliament granted franchises to companies to construct highways and to charge tolls for travelling on them.

History repeats itself in human affairs. About 10 years ago a movement was started in this country to

C. A. CROSSER
Executive Secretary,
Municipal League of
Seattle and King County,
Seattle, Washington

build and improve highways and maintain them from the proceeds of tolls paid by travellers, essentially as was done in England a century ago.

It was becoming clear to good roads enthusiasts that if we are to have cross-country highways adequate to handle the growing motor traffic, fiscal support must come from some source other than gasoline taxes which are becoming dangerously high. So in the past 10 years, projects have been devised for new toll roads in many parts of the country. More than 5,000 miles have either been constructed or are contemplated. The states across which they will run are their sponsors and issue the revenue bonds to pay for them. The tolls, paid by the travelling users, will pay off the bond issues and usually the costs of their maintenance. The well-founded hope is that when the bonds are paid off, the tolls either will be abolished or diminished.

But this radical change from our tradition of free highways is arousing opposition like the Rebecca movement of a century ago. The governor of Colorado recently announced that so far as he was concerned, there would be no toll roads

in his state. Petitions have been circulated in Seattle protesting the location of a new toll highway through this city. There is a movement in some of the western Chicago suburbs to oppose a proposed toll road through that district. The Public Roads Association of Missouri has retained a Kansas City advertising firm to launch a campaign against toll highways in that state.

However, the pressure for more, wider and faster highways is likely to be much stronger than these sporadic bursts of opposition which are not sufficiently potent to halt construction.

Building and maintaining major highways from tolls is not new but dates back hundreds of years. The term "turn-pike" which is what some of these toll roads are called, has an interesting origin. In medieval times, pikes or sharply pointed poles were planted across roads as a defensive measure against enemy horsemen. Thus in later years a road with a bar across it which would only be raised after a traveller paid his fee, was known as a "turn-pike". "Down the pike" is a related expression.

In 1346, King Edward III of England granted a franchise to a hermit named William Phillippe to erect a gate and collect tolls on a stretch of highway near London if he would keep it in passable condition. Later there were many such road custodians throughout the kingdom; but it wasn't until 300 years later that road-building was really launched in England. Rapidly growing commerce required better roads. But abutting property couldn't raise enough taxes to build them.

So in 1663, Parliament enacted a law which authorized the granting of franchises to private turn-pike

(Continued on page 166)



NEWS BULLETINS

AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Baxter Named Chairman of Nominating Committee

Newark, New Jersey—Edward P. Decher, Secretary of the Joint Sewer Commission of Newark and President of the American Public Works Association recently named Samuel S. Baxter, Water Commissioner for the City of Philadelphia as Chairman of the APWA Nominating Committee. Others appointed to serve on the committee are: John Morin, City Engineer, Oakland, California; Ralph Graham, Superintendent of Public Works, Davenport, Iowa; Wendell La Due, Superintendent and Chief Engineer, Bureau of Water Supply, Akron, Ohio; and August Zentgraf, Chief Engineer, Department of Public Works, Newark, New Jersey. The Committee will propose a slate of officers and directors to the membership in the near future, and the results of the election will be announced at the 1956 Public Works Congress and the Equipment Show in Fort Worth, Texas, September 23-26.

Tennessee Chapter Elects Officers at Smoky Meeting

Gatlinburg, Tennessee—R. V. Moschell, City Engineer of Alcoa, was elected president of the Tennessee Chapter of the APWA at a meeting held in the beautiful resort town of Gatlinburg in the Smoky Mountains on May 15th. Mr. Moschell succeeds W. E. Stone, Commissioner of Public Works of Lebanon who served as president of the chapter for the past year. Henry Loeb, Commissioner of Public Works of Memphis was elected Vice-President and Murphy Snoderly, Engineering Consultant for the Municipal Technical Advisory Service of the University of Tennessee was named Secretary-

Treasurer. The meeting was held in conjunction with the 17th Annual Meeting of the Tennessee Municipal League which headlined an address by Senator Albert Gore and another by Governor Frank G. Clem-



Tennessee Chapter elections named Murphy Snoderly, left, Sec'y-Treas. and R. V. Moschell as President, succeeding W. E. Stone, right.

ent. The chapter meeting itself featured a very informative paper titled, "Slurry Seal Coats With Emulsified Asphalt", which was presented by John B. Dunbar, District Engineer of the Asphalt Institute. L. H. Clouser, Consulting Engineer of the firm of Wiedeman & Singleton of Atlanta, Georgia also gave an interesting talk on Gatlinburg's new sewage disposal plant and led the group on a guided tour through the plant.

Konefes Named Prexy of Chicago Chapter

Chicago, Illinois—Approximately 135 members and guests attended the annual spring meeting of the Chicago Metropolitan Chapter at Chevey Chase Country Club on Thursday, May 24. A golf meet preceded the afternoon discussion sessions on street and sanitation problems; while the evening was devoted

to a fun-for-all dinner meeting with prizes galore. Newscaster Fahey Flynn, was the guest speaker. Al Konefes, Superintendent, Bureau of Equipment, of Chicago was elected president of the chapter to succeed C. L. Baylor, Village Engineer of Downers Grove. Bill Smaha, Administrative Assistant, of Brookfield was named first vice president while Armond Lund, Superintendent of Public Works of Wilmette was named second vice-president. The Secretary-Treasurer's post went to Charles Sramek, Superintendent of the 41st Ward of the City of Chicago. Jack H. Gould, Editor, "Street Engineering", Chicago, was moderator of the street problem panel and Robert Anderson, Superintendent of Public Works of Winnetka led the afternoon discussion on sanitation problems.

SMU vs Notre Dame

Dallas, Texas—Football fans attending the 1956 PUBLIC WORKS CONGRESS AND EQUIPMENT SHOW in Fort Worth, September 23-26, will want to attend the opening game of the 1956 Football season at the Cotton Bowl in Dallas, Saturday night September 22nd. Notre Dame will be pitted against Southern Methodist University of the Southwest Conference. The game will start at 8:00 pm. Applications for tickets, priced at \$5.00 each, will be received by mail only beginning August 1st. Tickets will be mailed by September 15th. Send cashier's check or money order to: SMU Athletic Department, Dallas, Texas; and enclose 25¢ mailing fee with each order.

OFFICERS: Edward P. Decher, Newark, N. J., President; Frederick W. Crane, Buffalo, N. Y., Vice President, Eastern Area; Kenneth K. King, Phoenix, Arizona, Vice President, Western Area; Walter M. Swietlik, Milwaukee, Wisconsin, Vice President, Central Area; Albert G. Wyler, New Orleans, La., Vice President, Southern Area. DIRECTORS: W. D. Hurst, Winnipeg, Manitoba, Canada; Sol Ellenson, Newport News, Virginia; Roy W. McLeese, Salt Lake City, Utah; Jean L. Vincenz, San Diego, California; Warren A. Coolidge, Nashville, Tenn., Immediate Past President; Donald F. Herrick, Executive Director.

Upstate New Yorkers Hold Annual Spring Meeting

Niagara Falls, New York—Over one hundred members and guests of the Upstate New York Chapter had a honey of a time at the chapter's annual spring meeting in the famous "honeymoon" city of Niagara Falls, May 13-15th. Mayor Calvin Keller spoke at the opening luncheon which featured a talk on air pollution by Arnold Arch, of the host city and another on sewage disposal by Fred Crane, General Manager of the Buffalo Sewer Authority. One of the highlights of the meeting

was a guided tour through the \$680 million Hydro Electric Power Plant at Niagara Falls, Ontario, Canada with Sir Adam Beck serving as Commentator. Members and guests also inspected the new \$8 million Water Filtration Plant and \$1.5 million Incinerator Plant at Niagara Falls, New York. Dr. Marvin A. Rapp, of the Buffalo Port Authority was the guest speaker at the annual dinner.

The business meeting featured a talk by APWA President Edward P. Decher of Newark, New Jersey and the election of officers. John A. Ulinski, Commissioner of Parks of

Buffalo was elected president to succeed David Mann, Director of Public Works of Niagara Falls, while Arvid Karkkainen, Construction Engineer, Department of Public Works, Rochester was elected Vice-President. John F. Hagerty, Senior Administrative Assistant, Division of Streets, Buffalo was re-elected Secretary-Treasurer.

Stancer Named President of New Washington Chapter

Yakima, Washington—The initial meeting of the newly organized Washington State Chapter of the APWA was held in Yakima on May 9th. William A. Stancer, Pierce County Engineer of Tacoma was elected first president of the new chapter; Chester E. Murray, City Engineer of Wenatchee was named vice president, and Chester L. Waggner, City Engineer of Pullman was elected Secretary-Treasurer. Others named to the Executive Committee were: P. N. Royal, Principal Engineer, Seattle; L. P. Staman, Director of Public Works, Tacoma; Robert Anderson, Construction Engineer, also of Tacoma, and George S. McLean, Commissioner of Public Works of Wenatchee. The program featured an excellent talk on "Soils Testing for Street Construction" by Herb Humphries, Soils Engineer, Department of Highways, State of Washington and another titled "Street Lighting—Present and Future" by Frank J. Miehle, District Lighting Specialist, General Electric Company. D. F. Herrick, Executive Director of the APWA was the guest speaker at the luncheon meeting. The program also included panel discussions covering contract plans and specifications, storm drainage, sidewalks, and street maintenance. One of the most significant actions taken by the new chapter was the adoption of a proposal advanced by W. E. Parker, City Engineer of Seattle that a drainage committee be established to conduct a thorough study of the storm water drainage problem and submit recommendations to the chapter membership at the next meeting.

Kentucky Chapter Holds First Meeting at Louisville

Louisville, Kentucky—Over forty members and guests attended the Inaugural Meeting of the Kentucky Chapter of the APWA at the Beargrass Creek pumping station in Louisville on Thursday, May 24th. The meeting was arranged by Earl Patton, City Engineer of Owensboro who is the Association's State Chair-

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PUBLIC WORKS for July, 1956

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man in Kentucky, and a Local Committee headed by Wallace "Tubby" Sanders, City Engineer of Louisville. The morning session was devoted to a discussion of street and highway problems and an inspection trip through the city's new \$5 million pumping station. The afternoon session, which followed a luncheon at the pumping station included a business meeting and a general discussion of refuse and sewage disposal problems. Robert Bugher, Assistant Director of the American Public Works Association of Chicago, discussed the activities and

services of the APWA at the business meeting. Robert Davis, Superintendent of Public Works of Covington was elected to serve as the first president of the new chapter. John Leake, Director of the Department of Sanitation of Louisville was named Vice-President, and R. S. Weikle, Jr., Superintendent of Sanitation of Owensboro was elected Secretary-Treasurer. Others elected to serve on the Executive Committee were "Tubby" Sanders, City Engineer, Louisville; James Marshall, City Engineer, Frankfort; W. D. Anderson, General Manager,

Sanitation District #1, Covington, and John A. Hettler, City Manager, Owensboro.

N.Y.-N.J. Chapter

Visits Babylon Town Incinerator

Babylon, N. Y.—Attendance was high at the Spring Meeting of the N. Y.-N. J. Metropolitan Chapter, when members and their friends were guests of the Town of Babylon, Suffolk County, New York. The meeting was arranged by Donald C. Muncy, Town Supervisor, with the assistance of the Long Island Park Commission and the New York State Department of Public Works. The busy program for the day included inspections of the Town's big new incinerator and a variety of equipment exhibits at the incinerator site. Following a buffet lunch, courtesy of the Township, an address of welcome was made by Supervisor Muncy. Milton E. Goul, Dist. Engr. of the New York State Dept. of Public Works spoke on "Coordination Between State and Local Governments in the Highway Program," and Henry W. Taylor, Consulting Engineer of Freeport, N. Y., described the Babylon Septic Tank-Digester which is under construction adjacent to the incinerator and which is designed to dispose of pumpings from septic tanks and cesspools in a nuisance-free manner. Chapter President Frank Klaess, Supt. of Public Works of Rockville Centre, N. Y., conducted the meeting in his usual capable manner. Field inspection trips were made to nearby recreation facilities, including the Jones Beach Amphitheatre and the Marina at Captree State Park. A cocktail and dinner and the La Grange Inn topped off an enjoyable day.



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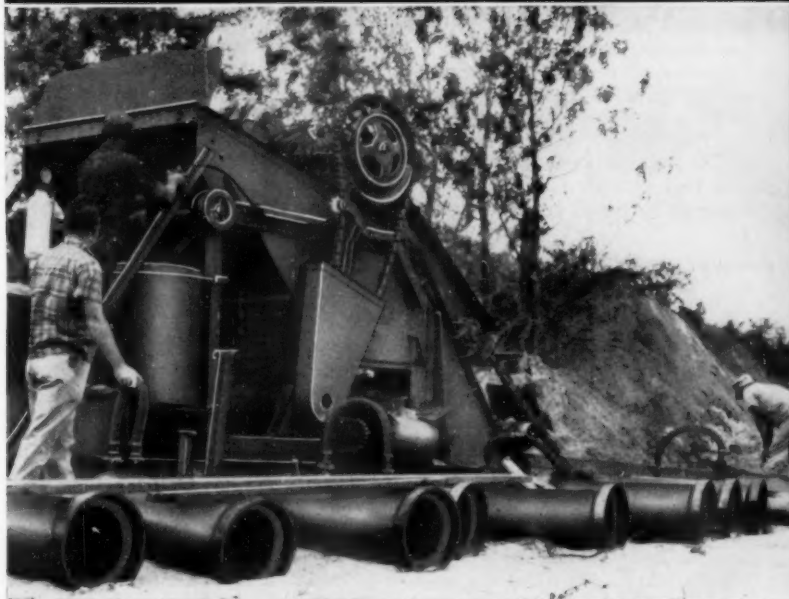
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Wind-Measuring Stations Trace Polluted Air

Buffalo, New York—Techniques for tracing air paths associated with heavy pollution concentrations by means of a network of wind-measuring stations were described at a recent meeting of the Air Pollution Control Association in Buffalo, New York. Edwin K. Kauper, senior meteorologist with the Los Angeles County Air Pollution Control District, explained that trajectories have been constructed for heavy smog situations from 1952 to 1955, showing the routes taken by air parcels from the time they crossed the coast-line until they arrived at an air sampling station loaded with pollution. Evidence presented by

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these studies, based on reports from 64 stations, has forced a re-evaluation of pollution sources since nearly all cases indicated a flow over predominately residential rather than industrial sections of the Los Angeles Basin.

Studies of the air movement on smoggy days indicate that the air aloft is not such that pollution could be brought to the central part of Los Angeles from an area other than that described by the path of construction based on wind reports.

Mayor Erwin of Tarrant Heads Alabama Chapter

Montgomery, Alabama—The 1956 Annual Meeting of the Alabama Chapter was held in Montgomery, on May 3 and 4. Members and guests were welcomed to the host city by Mayor W. A. (Tacky) Gayle. The program featured a panel discussion on public works problems and a paper on "Refuse Collection and Disposal" by Sam D. Lasseter, Commissioner of Public Works of Gadsden. The delegates at the meeting also inspected Montgomery's New Municipal Garage and—on the lighter side, enjoyed an old fashioned barbecue which is so famous in the deep South. Felix (Bud) Erwin, Mayor of Tarrant, Alabama was elected president of the chapter to succeed Oliver P. Wright, Superintendent of Maintenance for the City of Montgomery. Neal McRae, Superintendent of Streets and Sanitation, for Birmingham was elected Vice-President, and Joe E. Dunn, also of Birmingham, was re-elected to the post of Secretary-Treasurer.

350 Attend Western Conference

Oakland, California—The 1956 Western Public Works Conference held at the Leamington Hotel in

Oakland, on April 15, 16 and 17, attracted over 350 Public Works Officials from the eleven Western states. John A. Morin, President of the Northern California Chapter, A. P. W. A., presided at the opening session on Monday, April 16, which was devoted to a discussion of "The Federal Aid Highway Program." Principal speaker at this session was Mr. A. C. Clark, Washington, D. C., Deputy Commissioner of the U. S. Bureau of Public Roads. Mr. Raymond Archibald, Division Engineer, U. S. B. P. R., was moderator of the panel which discussed assigned topic. The panel consisted of Mr. R. H. Baldock, State Highway Engineer of Oregon, Mr. O. R. Dinsmore, Assistant Director of Highways of the State of Washington, Mr. A. C. Keith, Road Commissioner of Riverside County, and Mr. John Murphy, Principal Highway Engineer of the California Division of Highways.

The afternoon General Session covered the general subject, "Functions of Public Works Under Disaster Conditions." Wesley McClure, President of the City Managers' Section of The League of California Cities, presided at this session which featured Mr. M. Justin Herman, Regional Administrator of the U. S. Housing and Home Finance Agency as the principal speaker. A panel composed of City Managers and Engineers from recent California disaster areas contributed greatly to this timely season.

The morning meeting on April 17 consisted of two concurrent sessions, one on "The Professional Manpower Problem" and another on "Financing Capital Improvements." At the "Manpower" session, Mr. Robert Glenn of the Institute of Transportation and Traffic Engineering presided and introduced the principal speaker, Morrough P. O'Brien, Dean of Engineering of the University of California, who spoke on "The Fu-



C. A. Harrell, City Manager of Cincinnati, speaking at recent meeting of the Ohio Chapter. Others are Thaddeus Montgomery, City Engr., Cincinnati; Roy J. Fiemeyer, Director of Public Works, Hamilton; and Leo Flotron, Chief Highway Engr., Dayton.

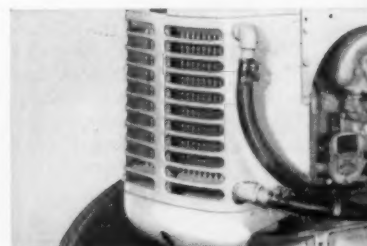
Check These Points Thoroughly before buying a combination Tractor-Compressor

- Absence of these engineering design features can mean less work done and more cost on your next job.

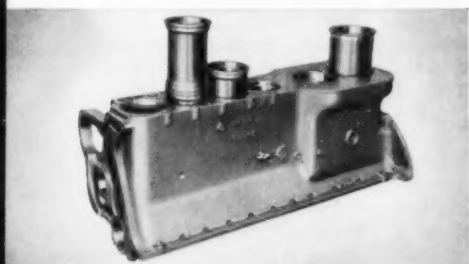
In recent years, combination tractor-compressor units have been increasingly popular. This is due, in large measure, to the fact that machines of this type are much easier to keep at work all day than their counterparts: an ordinary tractor and a standard portable compressor. To insure that you get the maximum benefit from any combination tractor-compressor unit, check these important points before buying.



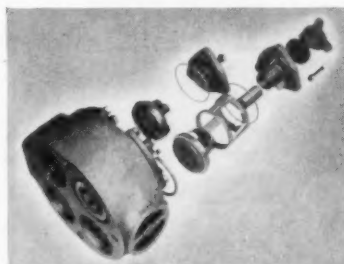
✓ **Location of the compressor air receiver** is important. The air receiver must be exposed to give you cool outside air in every operating condition, and should not hug the hot engine or be located next to the gas tank.



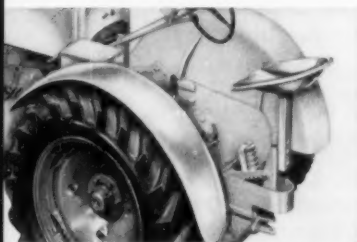
✓ **An air-cooled aftercooler** permits the tractor-compressor to deliver clean, cool, dry air hour after hour. Best cooling results can not be obtained from those units using a water-cooled manifold as an aftercooler.



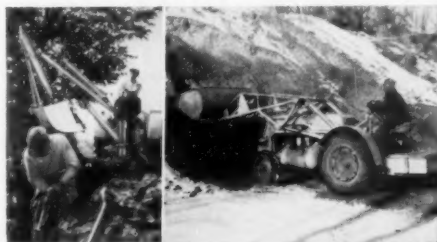
✓ **Replaceable wet sleeves** in the cylinder construction of your tractor-compressor eliminate costly reboring jobs, and give you more efficient cooling by directing a 360-degree flow of water around each individual cylinder.



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✓ **Wrap-around fenders are a must.** This is a major safety factor, particularly when the tractor is operating on rough ground or on highways and streets.



✓ **Many attachments for use with the unit** give you greater job versatility. Be sure your machine is designed for use with attachments such as the front-end loader, backhoe, and other tools.

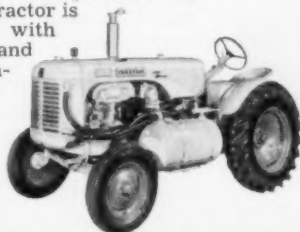


✓ **Plenty of operating space** is important, too. Be sure that your tractor-compressor permits the operator to drive and work efficiently and safely. He should be able to stand up while operating the unit.

✓ **A hood that is easily and quickly removable** helps reduce the time needed for minor repairs on your tractor-compressor. It permits preventive maintenance practices, too. Ask for this feature.

✓ **The fastest possible travelling speed** is a time-saving feature of the tractor-compressor. Be sure that your unit can get you from job to job in the shortest possible time.

✓ **If it's built and designed by one manufacturer** as a complete unit, you can be sure of maximum performance. Make sure that the tractor is designed to "work" with the compressor unit and is not an ordinary industrial tractor. The engine, too, should be a product of the manufacturer offering the unit. Your unit should "belong together."



These features can be found only in the Le Roi Tractair — a combination 42-hp wheel tractor and a 125-cfm air compressor. Be sure you get all the savings in time and money that the engineering design of Tractair offers you. Check before you buy.



LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

ture Availability of Professional Engineers." A panel discussion followed Dean O'Brien's address. This panel was moderated by Professor Harmer E. Davis, Director of the I.T.T.E. and was composed of Mr. Wayne Snowden, of the Institute, Mr. Richard Gallagher, Director of Public Works of the City of San Diego, Mr. W. G. Burris, District Manager of Remington-Rand, Admiral Carl A. Trexel, of The Tudor Engineering Company, and Mr. Scott Lathrop, Supervising Highway Engineer of the California Division of Highways.

The concurrent session on "Financing Capital Improvements" had Mr. Richard Carpenter, Executive Director of The League of California Cities, as its presiding officer. Paul Oppermann, Director of Planning of the City and County of San Francisco, was the principal speaker. Following his address, a panel of experts in the fields of bond financing, assessment districts, and lease purchase agreements discussed the various phases of financing capital improvements. Mr. J. Roy Holland, Director of Research, California Taxpayers' Association, gave "The

Taxpayer's Viewpoint."

The first General Session on the afternoon of April 17 dealt with "Planning Public Works." Presiding at this session was Emil Kaleschke, Member of the Board of Directors of the League of California Cities. Walter Hahn, City Manager of Monterey, spoke on "The Value of Advance Planning." This was followed by a panel discussion of the subject with Harold Flannery, Director of Public Works of San Jose serving as moderator. The panel included Lyall Pardee, City Engineer of Los Angeles, Reuben Owens, City Engineer of San Francisco, Dr. Neil Houston, Senior Economist of the Stanford Research Institute, and George E. Wade, Director of Public Works, Las Vegas, Nevada.

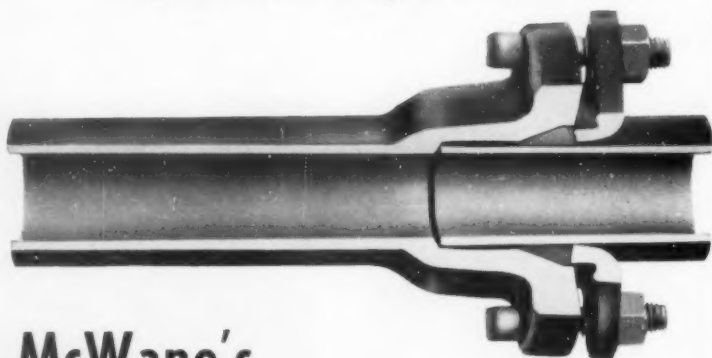
The final session was devoted to the subject, "Constructing Public Works in the West." Milton Offner, Past President of the Association, presided at this meeting and introduced the principal speaker, Frank B. Durkee, Director of Public Works for the State of California. Mr. Durkee's remarks dealt with the State's highway, water resources, and building program and were of considerable interest to the assembled delegates.

APWA President Edward P. Decher of Newark, New Jersey was the guest speaker at a "Get Acquainted Luncheon" on the first day of the meeting, and Mayor Clifford E. Rishell of Oakland was the featured speaker at the conference's closing banquet.

Michigan Chapter Tours Dow Chemical Plant

Midland, Michigan—Fifty members and guests attended the May meeting of the Michigan Chapter which featured a tour through the Dow Chemical Plant and an inspection of public works projects in the host city of Midland. During the forenoon, the group met at the Dow Auditorium where they were welcomed by City Manager, Ray Fry and Dr. W. H. Schuette, General Manager of the huge chemical plant. Speakers during the morning meeting were T.J. Powers, Superintendent of Waste Disposal at Dow, who talked on industrial waste disposal, and Gerald Decker, Assistant Superintendent of Power, whose talk dealt with power plant operations and smoke abatement. Arrangements for the meeting were made by C. A. "Chic" Johnson, City Engineer of Midland and Secretary-Treasurer of the Michigan Chapter.

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McWane's MODERN 20-Foot LENGTHS 2" and 2 1/4" CAST IRON PIPE

McWane 2-inch and 2 1/4-inch centrifugal CAST IRON PIPE in 20-foot laying length has all the well known characteristics of Super-DeLavaud larger-diameter pipe—smooth, straight barrel, even wall thickness, sound metal section, easy to cut and easy to tap.

But, it has fewer joints to make, lower construction costs. Every time you lay a pipe, your line grows 20-feet longer.

Service connections are made with standard corporation cocks for water and standard No-Blo tees for gas. Standard strap saddles or service clamps can be used if preferred.

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GULF SANI-SOIL-SET is the practical answer to your dust annoyance problems. Here are a few of the many good reasons why it will pay you to investigate this efficient dust-control medium now:

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LONG LASTING—Because of its extremely low volatility and insolubility in water, Gulf Sani-Soil-Set remains effective for long periods. One application per season or year is usually sufficient.

EASILY APPLIED—Gulf Sani-Soil-Set is free-flowing, easy and pleasant to use. It can be applied by hand-sprinkling or by sprinkling truck, and spreads quickly.

SAVES MAINTENANCE EXPENSE—Gulf Sani-Soil-Set minimizes dust annoyance and expense in near-by houses, stores, and laundries.

Write, wire or phone your nearest Gulf office today and ask for a demonstration of the advantages of this modern proven dust allayer. If you have not yet received a copy of the pamphlet which gives further information on this quality Gulf product, mail the coupon below.



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PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Requirements for Lawn Sprinkling

The demand for water for lawn sprinkling is great in many cities, and will continue to increase as movement of populations to suburbs increases. The peak demands generally occur on week-ends during daylight saving. In some places underground lawn-sprinkling systems are being installed, which greatly increase the demand. Several studies of rates demanded are described in the article. At Levittown, Pa., the maximum hourly rate in June, 1954, was ten times the average daily demand for the year. In industrial cities the week-end sprinkling load will not be enough to offset the week-day industrial load. The installation of distribution storage tanks or adoption of alternate-day sprinkling programs generally results in pumping economy. Milwaukee found that it would be necessary to double the plant capacity in order to meet the sprinkling demands; and has installed large storage units some distance from the pumping stations, with large-capacity pumps, which pump into the distribution system water which fills the storage units overnight. To collect the additional revenue needed for providing water for lawn sprinkling, some cities increase rates generally; some superimpose a surcharge for hose bibs and underground irrigation systems.

"The Lawn-Sprinkling Load." By Angus D. Henderson; L. S. Finch, of Indianapolis Water Co.; Melvin P. Hatcher, Dir. Water Dept., Kansas City, Mo.; and Edward F. Tanghe, Supt. Milwaukee W. W. Jour. AWW Ass'n, April.

Storage to Meet Peak Demands

Inability to meet increasing peak demands must often be remedied by increasing pumping capacity and even by adding distribution mains; but in many cases it may be cheaper and equally satisfactory to supply

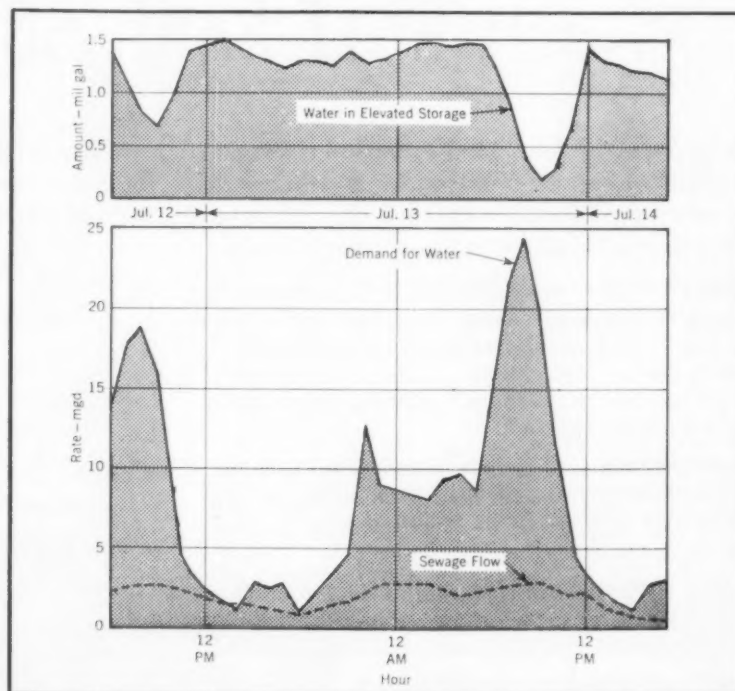
storage designed and located to equalize the head on the distribution system. This method has been adopted by the S. E. Oakland Co. Water Authority. A typical graph of peak-day demands showed that the pumps could operate at a continuously constant rate throughout the 24 hours if storage be furnished for 25 percent of the day's demand. Should the peak demand of occasional days exceed the pumping capacity, storage would have to exceed this amount to spread the excess over several days preceding a peak day. The author considers that a safe procedure is to determine the capacity of low-lift pumps and treatment facilities by the maximum-day demand, and the capacity of booster pumping and storage by the maximum-hour demand. The Authority employs both elevated

tanks and steel ground reservoirs with booster pumps. The cost of an elevated tank up to 3 mg is 1½ to 2½ times that of a steel ground reservoir of comparable capacity.

"Peak Demand Storage." By George G. Schmid, Engr.-Mgr. Jour. AWW Ass'n, April.

Water-Borne Infectious Hepatitis

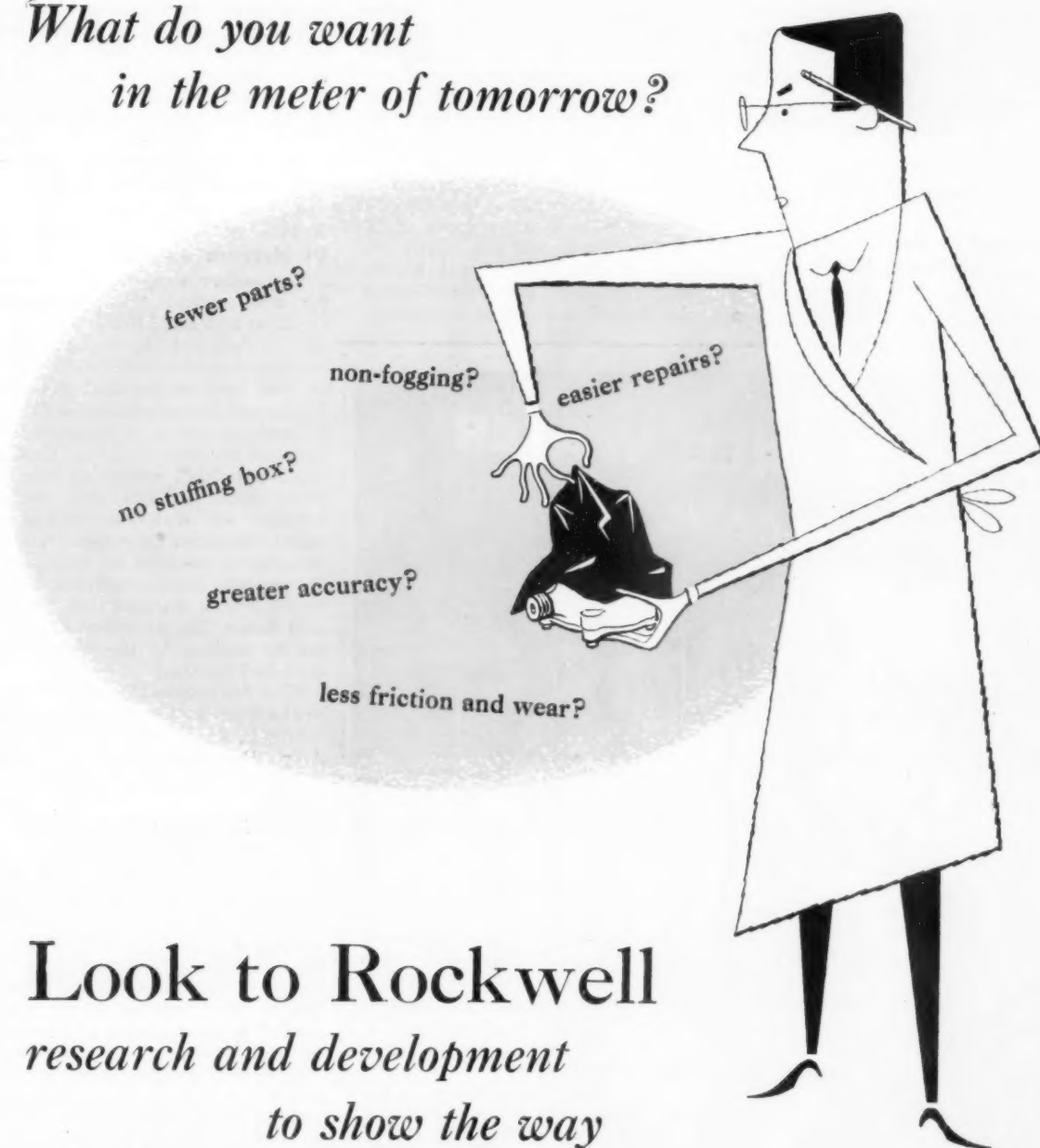
In New Delhi, India, there occurred in December, 1955, an outbreak of infectious hepatitis in which 25 percent of the population was affected. This was probably the first instance where coagulated, filtered and chlorinated water was clearly and unmistakably involved. This furnishes further proof that water can be an important factor in the spread of this disease; also that filters do not remove the virus;



Courtesy Journal AWWA

● WATER demand, storage and sewage flow for maximum day at Levittown, Pa.

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in the meter of tomorrow?*



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*research and development
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and that, under conditions existing in Delhi, chlorine did not inactivate it. However, it is believed that when water has been very well clarified by passage through a diatomite filter, a free chlorine residual of 0.5 ppm or a little more will inactivate the virus.

"Water-Borne Outbreak of Infectious Hepatitis." *Public Works*, June.

Recharge of Ground Water at Peoria, Ill.

Pumping ground water at Peoria has lowered the water level to a

dangerous point, and recharge from the river has been provided to increase the available well supply. Insufficient ground was available for recharging by ordinary methods, and a recharge pit is used, which is filled by gravity flow from the river. The bottom is 10 or 12 feet above ground water level. The pit is in gravel with 2.1% passing a 200-mesh screen. It has a 40 x 62½-ft. bottom, with a water depth of 12 ft. The bottom and side slopes are covered with 6 in. of pea gravel, which prevents silt from clogging the ground. A recharge rate of 20-

25 mgd per acre has been achieved, ¾ of which is through the sides. Chlorine is added to the water at the rate of 3 ppm, which gives a satisfactory quality at the wells from which it is drawn.

"High-Rate Recharge of Ground Water by Infiltration." By Max Suter, of Illinois State Water Survey. *Jour. AWW Ass'n*, April.

A New Method Of Network Analysis

The author suggests a name for this method "The Hydraulic Gradient Method of Network Analysis." It does not require expensive equipment and is sufficiently rapid to lend itself to practical use. For facilitating the calculation, a device is used consisting of paper scales mounted on wooden disks called a "disk assembly", containing four or more disks. An additional device consists of dial-type indicators called "elevation indicators." A disk assembly is prepared for each pipeline junction being considered, based on its length, diameter and roughness factor. The procedure of making an analysis by use of these is described in detail.

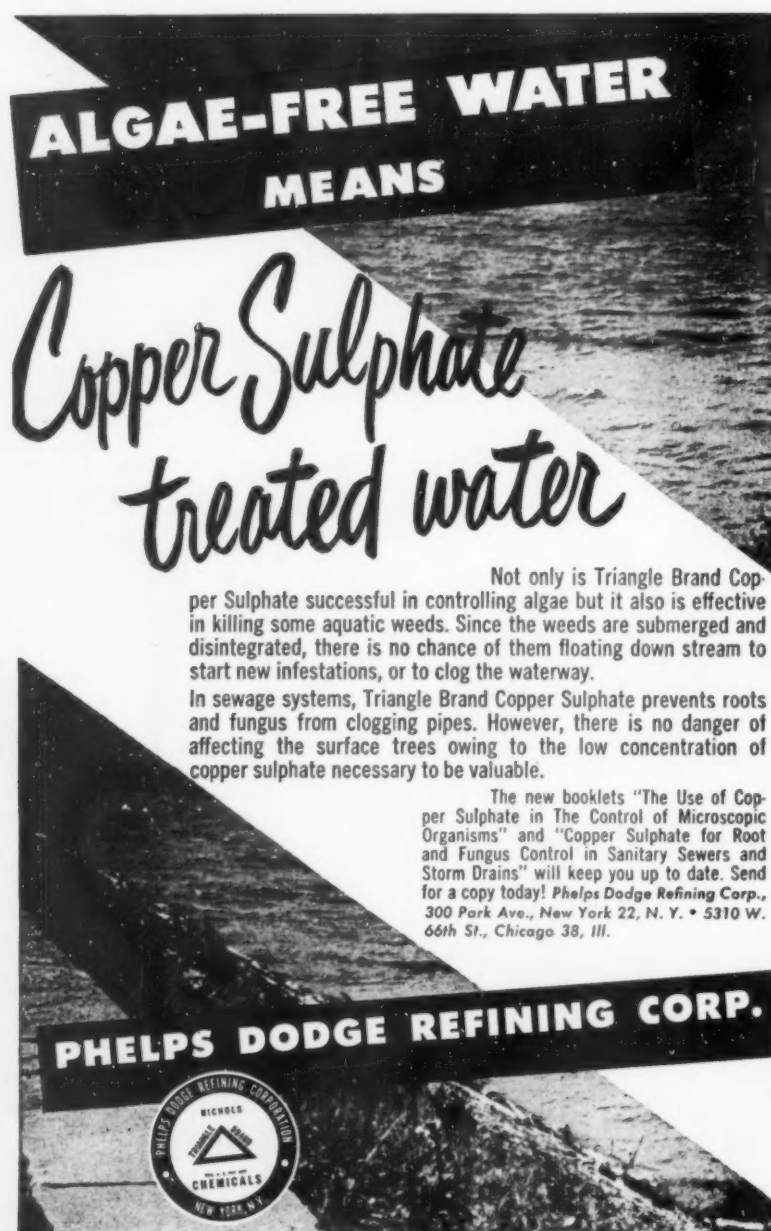
"The Analysis of Complex Waterworks Distribution Networks." By Edwin B. Cobb, of Metcalf & Eddy. *Jour., New England W W Ass'n*, March.

Controlled Draft From Reservoirs

Under this general head the *Journal* publishes papers on "Surface and Underground Storage", "Limitary Curve", and "Impounding Reservoirs." Fundamentally, storage is a source of supply from which water may be drawn when needed to meet abnormal demands or other emergencies, or to equate variations in demand. It is desirable, but not necessary, that emergency storage be in tanks or reservoirs from which water will flow by gravity to the place of use. It is convenient, but by no means necessary, that regulatory storage be so situated. Underground storage serves all the functions of surface storage below the pressure gradient. It automatically equalizes variations in supply; can be used to advantage for seasonal regulation; and is particularly useful for equalizing daily variations in water use.

"Surface and Underground Storage". By Raymond A. Hill.

Controlled Draft provides a simple means for obtaining maximum use of



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Copper Sulphate treated water

Not only is Triangle Brand Copper Sulphate successful in controlling algae but it also is effective in killing some aquatic weeds. Since the weeds are submerged and disintegrated, there is no chance of them floating down stream to start new infestations, or to clog the waterway.

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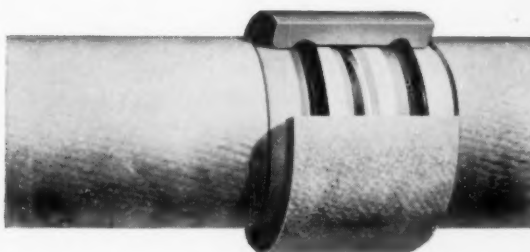
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Cutting construction and maintenance costs means tax savings for Madison Park, N.J. And low cost is practically inherent in "Century" Asbestos-Cement Pressure Pipe and "Fluid-Tite" Couplings. The light weight makes for easy, inexpensive transportation and handling, while "Fluid-Tite" Couplings allow quick assembly even with unskilled labor, slashing laying time and cost. Its non-corrosive feature means long underground life. And "Century" Pipe is non-tuberculating and non-electrolytic . . . the bore is always clean and smooth. Pumping pressures remain continuously stable.

Find out how "Century" Pipe and "Fluid-Tite" Couplings can reduce construction and maintenance costs for you. Write today for full details.

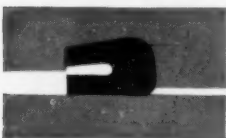
There's no problem in laying K&M "Century" Pipe in a curve. In this Madison Park housing development, "Century" Asbestos-Cement Pressure Pipe with "Fluid-Tite" Couplings allow 5° deflection but fit together easily, requiring no skilled labor for assembly.

and "FLUID-TITE"® COUPLINGS*

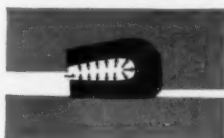


K&M's exclusive "Fluid-Tite" Coupling design allows pipe to slide into coupling easily. Water pressure automatically expands the rings.

*Patent applied for



"Fluid-Tite" sealing rings compress, permitting pipe to enter coupling easily.

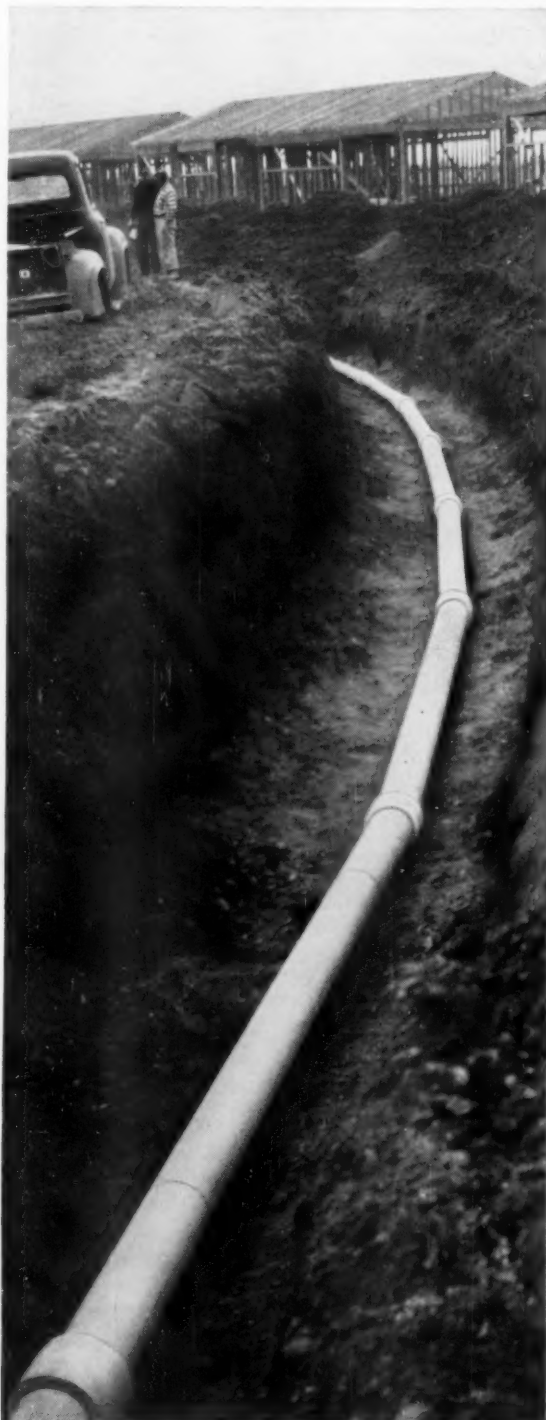


Water pressure in main expands rings; the higher the pressure, the tighter the seal.

"Century" Pipe and "Fluid-Tite" Couplings meet A.W.W.A., A.S.T.M., and Federal specifications and are approved by Underwriters' Laboratories, Inc.

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reservoir storage year after year, and may be worked out for any reservoir or system of reservoirs. The author describes how to prepare and use a "limitary curve" for this purpose. The runoff data for at least 20 years are plotted as a mass curve, and on this a draft curve is drawn. From a comparison of these can be learned the dependable draft during a critical dry period. A plot of the residual stored water volumes throughout the driest period is called the limitary curve, and indicates the minimum reservoir storage at any time when draft should be

limited to the lowest safe rate of withdrawal. A comparison at any time of a curve of current operations with the limitary curve represents the additional storage available, or the approach to the maximum draft that is safe.

"Limitary Curve." By Angus D. Henderson and A. S. Toth, of Hydrotechnis Corp.

New York City uses several sources of supply, with numerous reservoirs, large and small. In order to so control the draft from each source that the reservoirs will be full on the succeeding June, control

charts are prepared, showing the amount of storage required at any given date and the present actual storage. The storage at any given date includes the precipitation held on the watershed in the form of snow and ice.

"Impounding Reservoirs." By Edward J. Clark, Chf. Eng'r, Bureau of Water Supply. *Jour., AWW Ass'n*, April.

Plastic Pipe In California

Suburban Water Systems, Puente, Calif., after using plastic pipe for services for 20 months, discontinued installing this material. About 10 percent of the butyrate pipes have developed leaks in high-pressure zones and 5 percent have been replaced. However, the author believes that before long a plastic will be developed that will be suitable for services; and, with the cost so much less than that of other materials, it will come into general use. In discussing this paper, W. J. Cruse, V. P. of the Society of the Plastic Industry, said that a vast amount of research has been devoted toward developing thermoplastic pipe for water service.

"California Experience With Plastic Pipe." By Harold H. Yackey, Chf. Eng'r. *Jour., AWW Ass'n*, April.

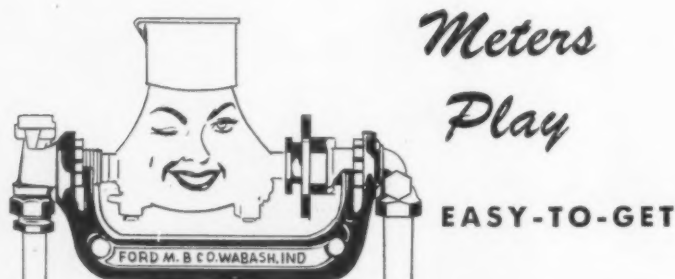
Rate Controller For Filter Plants

This article describes a new controller using a modified venturi meter with an annular throat, which forms no pockets for trapping either air or silt, and causes practically no loss of head when wide open, giving longer runs and decreased consumption of wash water. The controller costs less for both installation and operating, with freedom from maintenance troubles. It has no stuffing boxes; has a wide range, and unusual smoothness and accuracy of control.

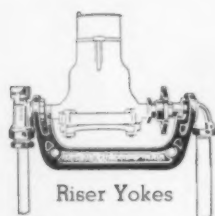
"New Rate Controller for Water Filter Plants." By E. Frank Stover, Director School of Eng., Univ. of Pennsylvania. *Water & Sewage Works*, April.

Starting Motor Pumps

A discussion of the several problems involved in determining the starting method to be employed in pump motor applications. Selecting the method involves: 1. Determining specifically which pump starting characteristic is applicable,



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Riser Yokes



Angle Yokes

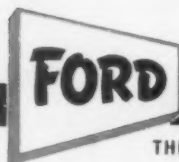


Straight Line Yokes

Dress a meter up in a Ford Yoke and see what a difference it makes. No more fighting misalignment of pipes or wrong spacing between couplings. Just an easy twist of the wrist and you've got your meter.

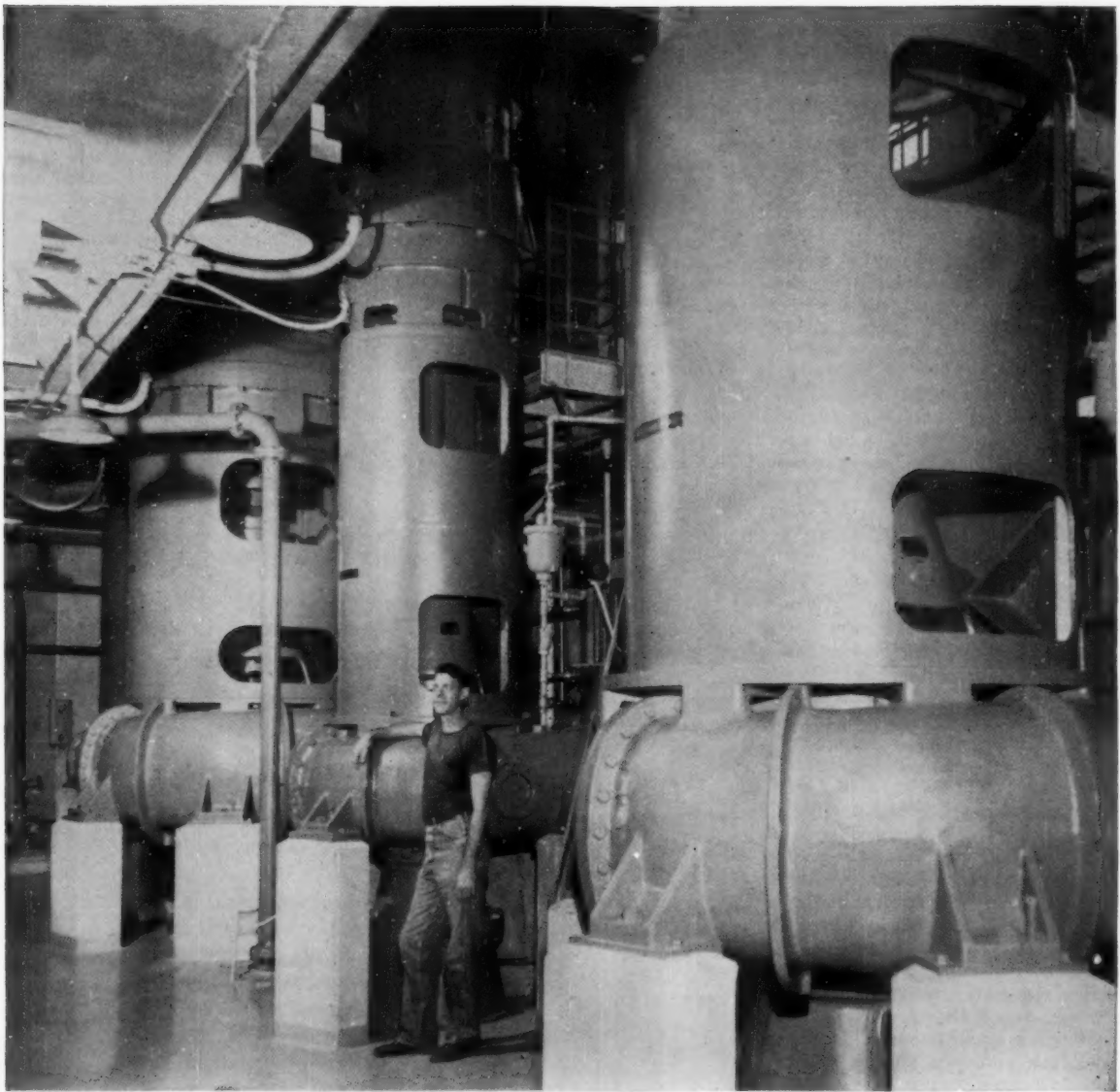
Ask your meter man. He'll tell you that an easy-to-get meter can be kept more accurate so that it lasts longer and earns more revenue. Millions of Ford Yokes are in use.

Send for the Ford Catalog and learn more about getting your meter's worth.



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24", 30", and 36" Fairbanks-Morse "Angleflow" pumps in Tampa's Krause St. station. Consulting Engineer—Greeley and Hansen, Chicago.

Master Plan for Tampa

To eliminate a serious bay pollution problem, Tampa has expanded its sewage treatment and disposal facilities by doubling the area served and connecting a 78% increase in population. The \$22 million investment includes a 36 m.g.d. treatment plant, six new pumping stations with 27 new Fairbanks-Morse sewage pumps. There are pumps in the Fairbanks-Morse line to move

any magnitude of municipal water supply at any appropriate pressure, and other pumps to meet ordinary or unusual problems of wastes treatment and disposal. A Fairbanks-Morse hydraulics engineer will be happy to work with your consulting engineer in specifying the right pump for your specific job. Fairbanks, Morse & Co., Dept. PW-7, 600 So. Michigan Ave., Chicago 5, Ill.



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(Typical characteristic curves should not be used except on a preliminary basis). 2. Determining if any starting current inrush limitations apply. 3. If a squirrel cage induction motor is best suited to the application, determine if it will accelerate the load while meeting any required current inrush limitations. 4. If chosen for other reasons, determine proper synchronous motor torque values or wound-rotor induction motor starting characteristics. This article discusses characteristics of induction motors through 500 hp, 720 to 1800 rpm; synchronous motors 200 to 3,000 hp, 200 to 1800 rpm, 1.0 power factor; and centrifugal and axial-flow pumps under various discharge arrangements and conditions.

By M. C. Boggis and E. O. Pott-hoff, of General Electric Co. *Water & Sewage Works*, April.

Microstraining As Used in England

Today there are nearly 60 microstraining installations either in operation or in course of construction, with individual flow capacities ranging from a few hundred thousand gallons to over 100 million gpd. The Metropolitan Water Board of London, England has four plants with a total capacity of 200 mgd. The author describes nine English installations, some of which include primary filtration prior to rapid and slow sand filtration or as a sole filtration process, or for polishing sand filter effluents. The advantages are said to include greatly reduced capital charges, nominal operating costs, small space occupied, small overall head loss, automatic operation and very low maintenance.

The strainer is a rotary drum revolving on a horizontal axis, to the periphery of which is fixed a microstraining fabric with aperture sizes of 65 to 23 microns, backed by a coarse mesh fabric for support. The drum operates in a manner very similar to the "North" and "Link Belt" sewage screens used for many years in this country. The flow ratings vary from 2,000 gal. per sq. ft. per hour to about 700 gal., depending on the concentration of solids in the raw water. The efficiency of filtration depends upon the formation of a thin mat of intercepted solids on the surface of the fabric, as in the case of diatomaceous filters.

"Microstraining and Its Applications." By P. L. Boucher, Glenfield & Kennedy, Ltd., London and New York. *Jour., New England W. W. Ass'n*, March.

Other Articles

"Reconditioning 36-inch Cast-Iron Trunk Mains at St. Louis, Mo." using the Centriline process. By Meyer Serkes, Div. Eng'r. *Water & Sewage Works*, May.

"Designing, Constructing and Maintaining Centrifugal Pumps: Axial Thrust." Part 10 of a series. By Roy Carter and Igor J. Karassik, of the Worthington Corp. *Water & Sewage Works*, May.

"Water Works Practices: Trickling Filters." By Don E. Bloodgood, Prof. of San. Eng., Purdue Univ. *Water & Sewage Works*, May.

"Aluminum Cover Protects Water

Works Reservoir" at Las Vegas. *Public Works*, June.

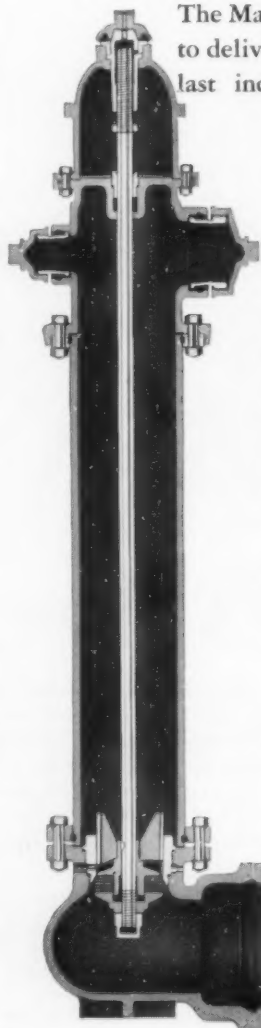
"Analyzing Flows in Water Distribution Systems" by means of the McIlroy Fluid-Network Analyzer. By Robert C. Moore, of Standard Electric Time Co. *Public Works*, June.

"High Strontium Content of Waukesha Water." By Carl E. Moore and Otho McFarland, of Loyola Univ. *Jour., AWW Ass'n*, April.

"Instrumentation for Radioactive-Pollution Studies." By Task Group Report. *Jour., AWW Ass'n*, April.

"Cathodic Protection at Los Angeles." Ten years' experience with water tanks. By W. E. Kirkendall, of Dept. of Water & Power. *Jour., AWW Ass'n*, April.

Reduce Wear, Save with Mathews



The Mathews Flange Barrel Hydrant is designed to deliver every available gallon of water and to last indefinitely with minimum maintenance.

CHECK THESE IMPORTANT FEATURES

The Flange Barrel

The swivel flange at the base of the nozzle section permits nozzles to be faced toward any point in the complete circle. Saves time on original installation and on replacements.

On broken hydrants, top cap and nozzle sections can usually be salvaged, thus reducing accident costs.

The Stuffing Box Plate

Cast integral with the nozzle section, the plate keeps water and sediment away from the operating thread. Hydrant remains operable in any weather. Wear on the operating thread is largely eliminated.

Made by

Available with mechanical joint pipe connections.

"Theory of Sedimentation." By P. H. McGauhey, of Univ. of California. Jour., AWW Ass'n, April.

"Another Link in Chicago's Water Works Improvements." The five-year program. By Dewey W. Johnson, of the Cast Iron Pipe Research Ass'n. Water & Sewage Works, April.

"Basic Radiological Health for Water Works Personnel." Fallout hazards and removal of radioactive materials. By David H. Howells of the USPHS. Water & Sewage Works, April.

"Filtration". The 29th of a series on "Water Works Practices". By George E. Symons. Water & Sewage Works, April.

"Baltimore's Big Year in Water."

Description in detail of work planned for 1956, including the Patapsco River development, Susquehanna River development and enlargement of the distribution system. By Howard Jacoby, Associate Editor. Engineering News-Record, May 3.

"Realistic Limitations of Flow Measurement Rangeability and Tolerance," as applied to flow meters. By Leland K. Spink and Richard C. Tamm, of the Foxboro Co. Jour., New England W W Ass'n, March.

"Standards for Deep Well Vertical Turbine Pumps." Committee Report. Jour., AWW Ass'n, April.

"New Record System Gives True Water Works Inventory Picture." By

Marvin C. Simon, of San Francisco Water Dept. Public Works, June.

"Fluoridation and the Courts." Decisions confirm rights of municipalities to adopt fluoridation. By James A. Tobey, Dr. P. H. Public Works, June.

"We Microwave Our Water Data." Reliable in all weather and cheaper than hiring telephone lines. By J. Paul Price, Supt. Warren, O. Water Dept. American City, May.

"Concrete for Large Dams." Data to be furnished in describing such concrete, as recommended by a Subcommittee of the International Commission on Large Dams. Water & Water Engineering, April.

"St. Louis County Water Company Expands." By Frank E. Dolson, Supt. of Distribution. Water & Sewage Works, May.

Time and Money Flange Barrel Hydrant



Breakable Flange and Stem Coupling

Optional feature furnished at extra cost. Specially designed flange in the standpipe just above ground level and a frangible coupling in the hydrant stem are designed to snap when struck a blow heavy enough to break the hydrant. Both can be replaced quickly and without excavating, while hydrant head, standpipe and stem remain undamaged.

ADDITIONAL ADVANTAGES

Two-way heads can be replaced with steamer and two-way heads without shutting off water.

Shield operating nut assures protection for the revolving nut from sleet, snow or dust.

An extension piece may be inserted between hydrant head and barrel or between barrel and elbow.

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Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

County Water Systems Expand In Georgia

With the completion of new county water systems now under construction in Gwinnett and Clayton Counties, Georgia, and the extension of distribution facilities by the cities of Gainesville, Roswell and other municipalities, a continuous network of water mains will extend from north of Gainesville in Hall County to Jonesboro in Clayton County and from Winder in Barrow County to Douglasville in Douglas County. This network of distribution systems will make an ample quantity of high quality water available to an estimated three-quarters of a million persons living in eight counties. The trend to county water systems servicing thickly populated rural areas is gaining momentum in all parts of the state, says the Georgia Water and Sewage Ass'n.

Wayne County, Mich., Roads, Water and Sewerage

The Board of County Road Commissioners of Wayne Co., Mich., is a 3-member body selected by the Board of Supervisors and incorporated under State law. This Board is responsible for developing and maintaining the County Highways System, the Metropolitan Sewerage and Sewage Disposal System and the Metropolitan Water Supply System. The County Road Fund during the 1955 fiscal year amounted to \$16,185,870; the Sewerage System income was \$842,958 and the total assets \$3,583,270; the gross revenue of the water system was \$1,279,574 and the total assets \$5,668,614, of which \$3,517,004 represented investment in mains and appurtenances.

Connect branch mains

without interrupting flow

Mueller Tapping Sleeves and Valves or Mueller Tapping Crosses and Valves give you a practical and economical method of running branch mains – without loss of water or interruption of flow in the main.

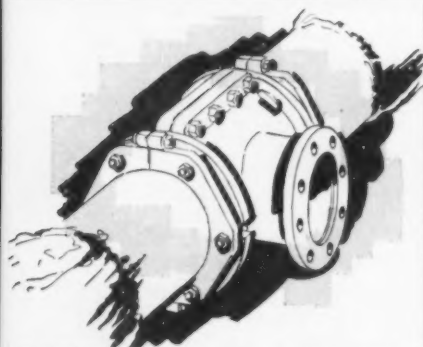
■ Calked or mechanical joint type are available to suit your individual needs. Extra long length of tapping sleeve or cross plus heavy construction actually strengthens the main where connection is made. Seat opening of tapping valves is larger than nominal size to permit full diameter cuts to be made. A nominal size of mechanical joint tapping sleeve or cross will fit all classes of cast iron pipe regu-

larly used, by using two sets of gaskets.

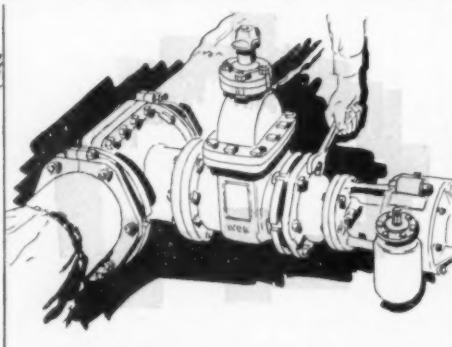
■ Mechanical joint tapping sleeves or crosses, to fit main sizes 4" through 12", offer various combinations of outlets 2" through 12".

■ Calked type tapping sleeves or crosses to fit all classes of pipe 3" through 36" with various combinations of outlets 2" through 16".

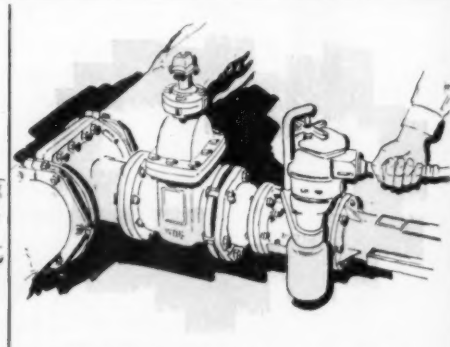
■ Mueller Tapping Valves, calked or mechanical joint type, are available with conventional packing or "O" ring stem seals. Both types have the same time-proven construction as the Mueller AWWA non-rising stem Gate Valve.



STEP 1: Attach sleeve. Clean main of rust and scale. Position and bolt tapping sleeve to main. Tighten mechanical joints or calk and lead sleeve.



STEP 2: Attach valve and drilling machine. Bolt tapping valve to tapping sleeve. Attach hand or power operated drilling machine to valve. Open valve wide.



STEP 3: Make cut. Move boring bar forward until it strikes main. Retract two turns—engage automatic feed—make cut. When cut is completed, retract cutter which retains coupon. Close valve—remove drilling machine.

Contact your Mueller Representative or write direct for complete information on Mueller Tapping sleeves and crosses, tapping valves and split repair sleeves.

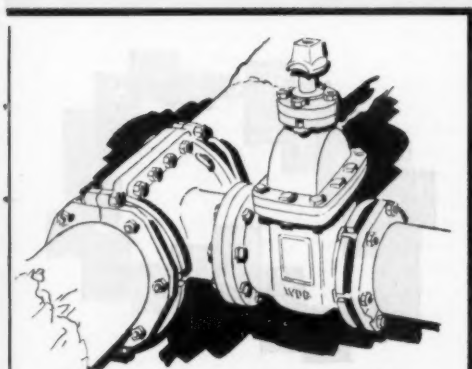
MUELLER CO.

Dependable Since 1857

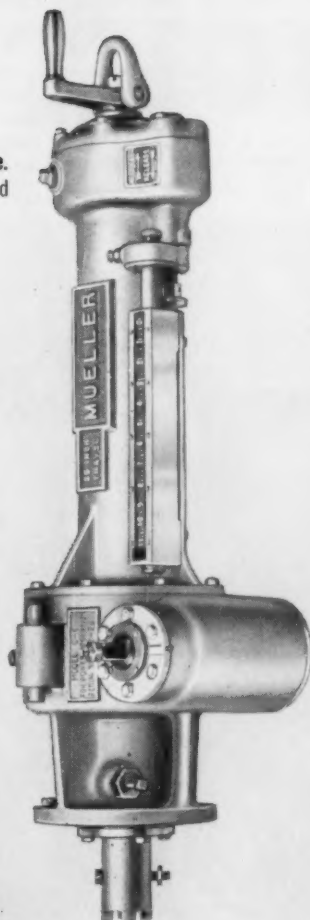
MAIN OFFICE & FACTORY DECATUR, ILLINOIS



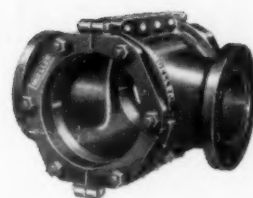
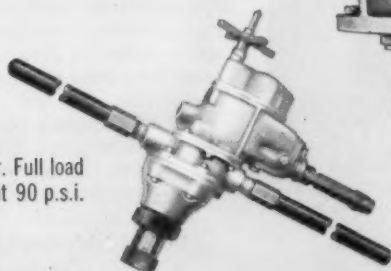
"CC" or "C-1" Drilling Machine.
Hand operated or power operated
for drilling through the main.



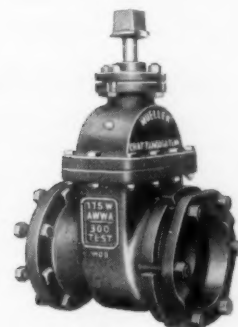
STEP 4: Make connection.
Slip branch main into valve and tighten mechanical joint or calk and lead main to valve. Open valve and branch main is activated.



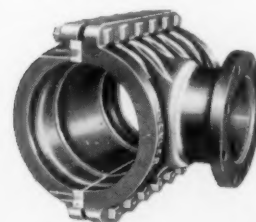
H-600 Air Motor. Full load
speed 56 rpm at 90 p.s.i.



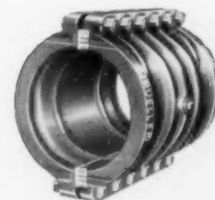
Tapping Cross. Calked or mechanical joint type. Nominal size fits all classes of cast iron pipe.



Tapping Valve. Calked or mechanical joint type. Perimeter pressure seating of discs. Conventional packing or "O" ring stem seal.



Tapping Sleeve. Calked or mechanical joint type. Nominal size fits all classes of cast iron pipe.



Split Repair Sleeve. Calked or mechanical joint type. One side of sleeve has tapped outlet with plug for escape of fluid while the sleeve is tightened around the leak.

Los Angeles Plans City-Wide Rubbish Collection

FOLLOWING experience with a pilot project in the Los Angeles Harbor Area, a program to provide for the collection and disposal of combustible rubbish and garbage throughout the entire city, by city forces, has been submitted by the Board of Public Works. For the fiscal year 1956-57, the total estimated cost is \$3,363,905. Of this, \$1,886,492 will go for trucks and equip-

ment and \$1,102,700 for land and yard facilities. The program will provide city wide residential service by Oct. 1, 1957, at which time the single-chamber incinerators will be banned.

The pilot project in the Harbor area was started Nov. 28, 1955. The cost per dwelling unit for collection and disposal to April 30, 1956, was 30 cents per week or \$10.84 per ton

collected; but in the month of April, 1956, costs were 27 cents a week or \$8.12 per ton. The costs include all pertinent indirect costs, such as the retirement fund and overhead expenses for Bureau, Departmental and General City administration. These indirect costs total 34.2 percent of the direct costs.

Budget Based on Long-Term Data

The budget estimate contemplates an average collection of 1.40 lbs. per capita per collection day (313 days per year) with a seasonal variation up to a peak of 1.82 lbs. per capita per collection day; this was based on detailed data on total actual and potential collections in the City of Long Beach over a period of years and is substantiated by data from other agencies and by the current experience in the Harbor area. It will be noted this is the average to be collected from all persons and all residences in the City, including some producing large quantities and many producing very small quantities of rubbish; it cannot be compared with the average quantity of refuse per residence or per capita collected by private collectors because they are employed mainly by householders with relatively large quantities of rubbish and by commercial establishments. The budget estimate contemplates an average cost for collection and disposal of combustible rubbish of approximately \$8.37 per ton. This is verified by the actual average cost of \$7.34 per ton for collection and disposal of non-combustible rubbish by the City and \$9.07 per ton for garbage in fiscal year 1954-55, and the actual cost for collection and disposal of combustible rubbish in the Harbor area in April, 1956, of \$8.12 per ton.

Several plans for continuing the collection of rubbish by private collectors have been submitted to the City by the organizations now engaged in this business and by their representatives. These have been carefully studied by the Board of Public Works which finds none of those which have been submitted will satisfactorily meet the existing need. The reasons include the following:

(1) All require a single collection agency to be given a monopoly for the private residential collection service in each area. Competition

International Harvester Company Host to Editors

Hosted by Harold T. Reishus, vice president, Construction Equipment Division of the International Harvester Company, a select group of magazine editors were guests at a recent equipment demonstration, with entertainment, at International's Dundee, Ill., proving ground.

Attendants included Leo J. Ritter Jr., of PUBLIC WORKS' editorial staff and Bob Shea of its Chicago office. Two full days were spent in touring the Tractor Works at Chicago and Melrose Park, Ill. The occasion was the introduction of the new Model 12 PAYLOADER and the complete-

ly new Models 18 and 24 PAYHAULERS; also the International-Drott 4-in-1 skid shovel and scarifier, six Hough PAYLOADERS with four International power units, and two sizes of the new V-line motor trucks. All topped off by a dinner at the Tam O'Shanter Country Club.

But what really stopped us was the inroads of luxury into the heavy equipment field revealed when a tractor operator calmly plugged an electric razor into the cigarette lighter orifice (yes, they have them too!) and began shaving!



● VISITING editorial group poses before Construction Equipment Division office.

in any residential area could not be obtained because the resultant cost would be exorbitant.

(2) They assume the City will adopt and enforce an ordinance requiring every householder to dispose of his rubbish weekly. Enforcement of this would obviously be impractical.

(3) No effective method of insuring continued satisfactory competitive service at equitable rates has been suggested. Collection of garbage and non-combustible rubbish by private collectors under contract with the City was tried by this city for several years; the service was proved to be increasingly unsatisfactory and, upon the outbreak of war, the contractors defaulted.

(4) They propose a minimum charge of \$1.00 per month for each dwelling unit, with a charge of \$1.85 or more per month for dwellings having more than the minimum amount of rubbish, or located in sparsely settled areas. Based on 816,000 dwelling units, this would cost the householders a minimum of \$9,792,000 per year, not including the cost for collection of larger quantities or from isolated residences, and not including the cost for supervision of the service by the City. If the City collects and disposes of this rubbish, the total cost to the same householders will be \$3,875,000 including the 34.24 percent indirect costs previously mentioned. This is less than half the minimum cost charged for private collection.

It should be noted that the program proposed by the Board of Public Works covers only the collection and disposal of residential refuse. It is proposed that refuse from commercial establishments continue to be handled by private collectors for as long as they render satisfactory service on a truly competitive basis at reasonable rates; this, and the contemplated increase in combustible rubbish collection in areas adjacent to the City, will afford continuing employment for those now engaged in this business and eliminate any undue hardship.

Less Air Pollution

There can be no doubt City collection of combustible rubbish will have many beneficial by-products, not the least of which will be reduction of air pollution and the elimination of health menaces and fire hazards. The program has been strongly endorsed by the directors of the Los Angeles Chamber of Commerce and the local newspapers.

A grain elevator gets a good going over, *INSIDE, OUTSIDE!*



COMPLETE BREAK-THROUGH IN WALL

How to save this costly structure, without rebuilding sections, presented a serious problem.

Workmen on scaffolds, from inside and outside, cut out deteriorated concrete.

Necessity of costly forming was eliminated by the use of THORITE 20-minute set, nonshrink, filling and patching mortar.

THORITE

THORITE permits completion of job in one fall of scaffold, followed immediately by THOROSEAL seal coat.



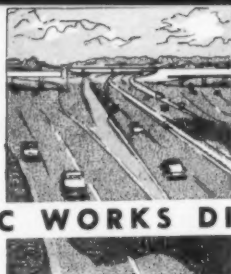
Air hammers cut away loose and crumbling concrete. THORITE formed into cleaned-out sections, with a minimum labor cost, restored elevators to original condition.

Job completed with the application of THOROSEAL over entire structure.

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STANDARD DRY WALL PRODUCTS, INC.
NEW EAGLE, PA. • CENTERVILLE, IND.





PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

County Road Identification

The General Assembly of Indiana in 1953 passed laws authorizing counties to adopt a system of road identification, and of house numbering where the population of the county is 400,000 or more. In accordance with these laws, the Indiana Association of County Commissioners has adopted a system of uniform identification for use by all counties. The grid system is used, taking, as axes of coordinates, range and township lines intersecting near the center of the county, thus dividing the county into four approximately equal quadrants. Roads located along the axes are designated Division Roads and Meridian Roads, respectively. Roads parallel to an axis are given numbers representing their distance from this axis in units of 100, followed by a letter indicating their direction from the axis. Thus, the first section line road east of the north-south Meridian Road is designated 100 E, and a section line road 3 miles south of the east-west base line is designated 300 S; an intermediate road $1\frac{1}{4}$ miles from an axis would be designated 175. Special principles are provided for numbering roads which are not parallel to an axis.

In numbering houses, the last two digits indicate the hundredths of a mile in a section, and the digits to the left represent section lines; thus the number 1225 E on road 100 S means that the house is in the southeast quadrant, about 12.25 miles east of the base line.

"County Road Identification and Numbering of Rural Residences." By A. K. Branham, of Purdue University. PUBLIC WORKS, June.

Striping Paints on Missouri Highways

In testing the durability of any paint under traffic, the Missouri Highway Department has applied a film with a wet thickness of only 4 to 6 mils; although the durability was

not always proportional to results with thicker films, this accelerated test was an excellent yardstick for measuring the durability. For applying a greater film thickness than 18 mils, a drag is used—a sled-like apparatus with runners 1 inch high with an adjustable blade across the back, weighted with 10 or 12 lb. This gives a very uniform film thickness where the pavement is smooth.

"Continuing Investigation of Paints Used to Mark Roads." By F. V. Reagel and J. Barton. *Better Roads*, April.

Developments in Lighting California Signs

In improving night lighting of highway signs, electrical engineers of the California Highway Dept. adopted as fundamental principles: 1. Provide uniform brightness of sign message. (Uniform illumination may not provide uniform brightness due to reflections.) 2. Make the brightness of sign panel sufficient so that it will stand out in contrast with its immediate surroundings. 3. Permit neither direct nor reflected glare. 4. Make the lighting equipment inconspicuous and so located that it will not interfere with the view of the message.

Fluorescent tubes are preferred to incandescent sources of light because 1. The continuous line source, provided by fluorescent lamps, fur-

nishes inherently superior uniformity of illumination horizontally across the sign panel. 2. Fluorescent lamps provide better uniformity of illumination from top to bottom of the sign panel. Illumination from a small light source decreases inversely as the square of the distance from the source. However, illumination from a line (fluorescent) source decreases inversely only as the distance from the source. 3. Considering top-mounted fixtures, the lower brightness of the fluorescent lamps causes less reflected glare on the sign panel from the source being "mirrored" in the sign panel. 4. The uniformity of illumination is less affected by burnout of one fluorescent lamp due to the overlapping light from other lamps. 5. Fluorescent lamps provide at least twice the lamp life. 6. Fluorescent lamps, including ballast losses, consume approximately one-half the power for equal light output.

Experiments and studies resulted in the adoption of fixtures which lighted the sign from the bottom rather than the top for the following reasons: 1. Top-mounted incandescent lighting of directional signs produces objectionable glare, in the form of reflected images of the fixture in the sign panel, and provides poor uniformity of brightness. 2. Top-mounted fluorescent lighting of directional signs produces less objectionable glare, in the form of re-



Courtesy California Highways & Pub. Wks.

● DIRECTIONAL signs, top-lighted above, and bottom, below, showing visibility.

Collects refuse . . . not trouble



HEIL Colectomatic provides More working time with Fewer working parts, Less maintenance

SIMPLY DESIGNED. Here's simplicity itself. Two hydraulic cylinders handle the entire loading and packing operation, automatically. The Heil Colectomatic has no chains . . . no hydraulic motors . . . no flexible oil lines from body to tailgate . . . no body retainer plates. Heil design eliminates these trouble-making wear points and reduces maintenance costs . . . gives more time on the job, more efficient collection service.

EASILY OPERATED. Flick a lever and walk away—an entire loading and packing cycle completes itself in 22 seconds. Bulldozer action of packing plate "rolls" load out of hopper . . . exerts horizontal pressure to compress more refuse into the body. The Colectomatic's operating mechanism runs intermittently (not continuously as with chain-type) . . . reduces unproductive wear, cuts down on noise.

EASILY SERVICED in a matter of minutes. Simply open side panels of tailgate and lubricate mechanism from standing position. Entire operating mechanism is easily accessible for routine inspection and adjustment.

Get all the facts from your Heil distributor. Ask for a demonstration and see for yourself how the Colectomatic's simplicity-in-action can lower refuse collection costs for you.

BH-62

NEW HEIL MOVIE, "Made to Order," describes new Colectomatic in full sound and color. Address requests for free use to The Heil Co., Body and Hoist Division, Milwaukee 1, Wis.

THE HEIL CO. DEPT. 4476, 3044 W. MONTANA ST., MILWAUKEE 1, WISCONSIN

Factories: Milwaukee, Wis., Hillside, N.J., Lancaster, Pa.

flected fixture images, than incandescent lighting, and provides fair uniformity of brightness. 3. Bottom-mounted fluorescent lighting does not produce glaring reflections of the fixtures. Therefore improvement in light control and intensities with this type of fixture will result in improved visibility of the sign. The lamps are set a distance in front of the sign equal to half the height of the sign panel, which appears to give the optimum result.

"Sign Lighting Fixture Development in District IV." By Vernon H. Waight and John R. Brass, Electric

cal Eng'rs of the Highway Dept. *California Highways*, April.

State Shop Makes Traffic Signs

The Massachusetts Dept. of Public Works produces about 50,000 traffic signs a year in a shop located in a new \$3,000,000 headquarters at Wellesley. Massachusetts signs are made large so as to be visible and readable by a driver going 60 mph at sufficient distance to enable him to stop. Practically all signs and markers are reflectorized; which

has been found to reduce night time traffic accidents by 23.3%. Steel blanks used for signs are sprayed with zinc chromate primer and finishing coats; wood backing receives three coats of enamel; aluminum blanks require only cleaning and etching. Reflective sheeting is used on 80% of the signs.

"Modern Traffic Sign Shop." PUBLIC WORKS, June.

Other Articles

"Building County Roads in Gumbo" in Leflore Co., Miss. By Daniel K. Kelly, County Eng'r. *Better Roads*, April.

"Servicing Road Equipment in Field." Practices of several highway departments. *Better Roads*, April.

"Computers Free Engineers for Other Work." Electronic computers used by Arizona Highway Dept. By Glen Ryden, Chf. Computer. *Better Roads*, April.

"A Portable Capacitance-Type Soil Moisture Meter. Highways and Bridges (England), April 18.

"Calcium Chloride Stabilization as Related to Soils Base". Practice of the District of Columbia, where both plant mix and road mix, preferably the former, are in general use for stabilizing bases. Stage construction of new roads is described. By H. F. Clemmer, Eng'r of Materials of Dist. of Columbia, *Public Works*, June.

"Ohio's Campaign Reduces Accidents at Hazardous Locations". *Public Works*, June.

"Design of Road Intersections" to reduce perilous traffic conditions. By Kenneth Summerfield. *Contractors Record*, April 25.

"How Much Paint to Stripe a Mile". Figures from several states. *Public Works*, June.

• • •

New Types of Faced Concrete Blocks for Construction

Concrete block is an important building material. It is now predicted that use will widen materially with the development of new types of faced concrete blocks which will provide enduring and attractive finishes at very low cost. According to George Kogel, president of the Concrete Corp., in a paper before the Society of Construction Superintendents, there are three kinds of faced block available: (1) a cast face compressed of a terrazzo-type mixture; (2) a block with a laminated plastic face; and (3) a truly monolithic faced block with a vitreous glazed cement surface.

The terrazzo-type facing on concrete block is composed of crushed marble chips and marble dust, mixed in colored cement. The mixture is cast $\frac{3}{8}$ in. thick and simultaneously bonded to the block. This type can

BAKER Flink

NOW A TEAM FOR

Ice and Snow Control



BAKER SNOW PLOWS...

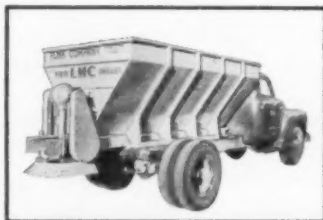
The "Roll Action" of the moldboard and the spring loaded sectional "Safety Trip Blade" are the reasons for BAKER Snowplow superiority in top speed snow removal from highways and runways. Flink-Baker Snowplows give an extra measure of performance and service worth your investigation.

Specializing in reversible and one-way plows... hydraulic power lifts to meet every specification... with both underframe and front push mounting. Have a Flink-Baker reference Catalog #110 in your file. Write today—there's no obligation.

Flink "One-Man" SPREADERS

This Flink LMC Model Spreader is without comparison for heavy-duty ice control. Handles salt, cinders, sand, etc. A totally different kind of single or dual spinner drive cuts maintenance to a new low—ups performance to a new high—can be used as a team with Baker Snowplows. Also available, tailgate type spreaders—chain and hydraulic drive.

DEPT.
5613



THE
Flink co.

STREATOR, ILLINOIS



**Deep in the Heart of Texas
KERRIGAN Lights the Brightest Field
in the Nation's Biggest State!**

At huge sprawling Texas Memorial Stadium, Austin, Texas, spectators watch in comfort and players handle the ball with ease on the nation's best lighted football field. Atop each 500-foot stretch of wall KERRIGAN's 100-foot, *Weldforged* Steel Standards are spaced in pairs. And 576 floodlights, mounted in batteries of 72 atop each pair of standards, illuminate the 160-foot width of field from a height of 170 feet. The Kerrigan standards, octagon-shaped and continuous tapered,

are based in concrete to withstand 100-miles-per-hour winds. Kerrigan lighting standards are now found in cities and suburbs throughout the United States. In parks and parking centers, on streets, highways, and bridges—wherever there is need for modern lighting—Kerrigan lights the way. *Weldforged* from J. & L.'s low-alloy, high strength, corrosion-resistant steel, Kerrigan standards weather both the elements and the years! Write now for catalog.



For better lighted fields and streets the standard is Kerrigan!

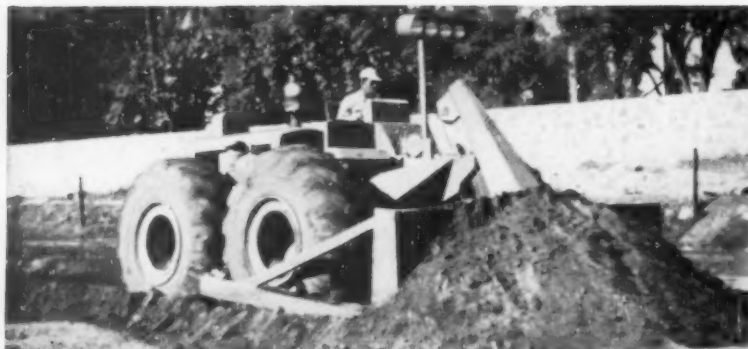
KERRIGAN IRON WORKS, INC.

NASHVILLE, TENNESSEE

General Sales Office

274 Madison Ave.

New York City



Drives job-to-job in city to handle wide variety of projects

In Mexico City, a 208 hp rubber-tired Tournatractor, and two 191 hp crawler-tractors, are used to handle construction and maintenance projects throughout the city and its suburbs.

Tournatractor drives to its assignments under its own power, at rubber-tired speeds. The two crawlers, however, must be hauled by truck-and-trailer to the streets or parks, where earthmoving work is needed.

Loading, moving, and unloading the two crawlers in the heavy metropolitan traffic is a big problem, reports the Mexico City engineer. Sometimes there also are serious delays because it is difficult to find a low-boy trailer available when crawlers should be hauled to the next project. In contrast, the city engineer finds Tournatractor's rubber-tired mobility a great advantage in cutting time and costs.

For instance, from work at one end of the city, the rig traveled 16 miles over city streets, through traffic, in a little over an hour. In one typical day, unit dozed down old poles and



When these pictures were taken, Tournatractor was leveling a city street linking Mexico City to suburban Mixcoac. On work like this, rig removes unnecessary concrete walls and walks, dozes over old poles, moves earth mounds, and handles a variety of other clean-up assignments.

stone fences, and leveled a street for paving on one side of town. It then traveled to another suburb to demolish old buildings that menaced public safety and stood in the way of new streets.

Pulls down 4-story facade in 30 minutes

Here is one example of the versatility and power of Tournatractor:

The front of a 4-story reinforced concrete building in the Polanco section of Mexico City had been built about 6½ feet into city property. It was decided that the facade should be torn down.

Tournatractor was driven to the building from a job about 15 miles away. Crews with air-hammers and blow-torches first cut all steel and concrete walls at a point 6½ feet back from the facade. Then the tractor's 1-inch cable was tied to a column, and the entire front of the 4-story building was pulled down in 30 minutes.

If your department has the problem of small, widely-separated assignments, why not investigate the advantages of a powerful high-speed tractor that can move under its own power between assignments? Write for complete information on this versatile rubber-tired Tournatractor today

LeTourneau- WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

Tournatractor—Trademark Reg. U.S. Pat. Off. T-1001-P-zw

be used for both exterior and interior walls and the facing can be applied on either side or both faces. Many colors are available.

The plastic facings are usually composed of a thermo-setting resinous binder, coloring and fire-proofing agents and other ingredients. The facing is applied at about 350°F after the block is set.

The cold glazed cement finishes consist essentially of portland cement, graded silicas, mineral pigments and special organic hardeners that create a surface glaze. The finish is applied in cold liquid form, sprayed on the block to a thickness of about 1/16 in., and smoothed out by vibration. After curing, the glazed surface forms a monolithic structure with the block itself. Elongation, tensile strength, flexibility and shock resistance are about the same as high strength cement. Water absorption is about 0.3 percent. The block can be manufactured in a variety of color combination textures and depths of finish.

A Small Community Can Have a Water System

ROLAND SCHRUPP,
Village Clerk, Plato, Minn.

In Minnesota Municipalities

CAN a village with less than 500 population afford a modern waterworks system? The answer for Plato, Minnesota has been an emphatic "yes."

In the winter of 1953, the Plato village council decided to have an engineering survey and preliminary report prepared on the relative costs, type of construction and financing methods for a sanitary sewer and sewage treatment system. While this report was being prepared, citizens became interested in the possibility of a new village-wide water storage and distribution system. The council then authorized the engineer to include a preliminary report on a waterworks system.

When the report on both projects was completed, mimeographed copies were made up and distributed to every family in town. A mass meeting was held, where the attorneys, bond financing representatives and engineers presented the complete picture of the proposed projects. After several weeks an advisory election was held with a vote of approximately seven to one in favor of the installation of the proposed waterworks system. However, the

sanitary sewer system was not approved.

When the project was advertised for construction, competition and a large number of bids resulted in a very low price. It was decided to use cement-lined, roll-on-joint, cast-iron pipe. A welded semi-elliptical 50,000-gallon tank and 100-foot tower was selected for water storage.

The village constructed the pump house and tower footings by force-account with considerable saving over estimated contract costs. A new submerged-type pump was used. Close attention to many of these apparently smaller items, combined with proper scheduling of the opening of bids, resulted in the final project cost being sufficiently below the original engineering estimates to permit the village to purchase water meters with the savings. The total project cost was approximately \$66,000.

Costs were assessed by means of a front-footage levy on business and residential property in the amount of \$1 per front foot for residential, \$1.50 per foot for business property, and \$1 per front foot for all vacant lots. An additional levy of \$200 was made for each residential and \$300 for each business place. The total amount of assessments was \$32,000 or about one-half of project costs. Of this amount, \$17,560 was paid in cash by property owners in order to save the interest charges made necessary if the levy were placed on the tax roll. The remainder was financed by issuing \$50,000 in 20-year bonds at an interest rate of four percent. These bonds will be repaid in yearly installments.

It was planned to have all work completed before January 1, 1955, but the system was in operation several days before Christmas, 1954. Two railroad crossings could not be included immediately due to failure of the railroad company to grant the necessary permits. These were installed in the spring of 1955.

Plato now possesses a modern water distribution system because of the unified support of its citizens and the council's forward thinking. Fire insurance costs have been reduced 39 to 42 percent per year for residential property and 20 to 25 percent per year for commercial property. Several of the business places have found that their fire insurance savings alone will pay the entire assessed cost over a two or three-year period. Housewives are now able to use all the water they want for lawn sprinkling, automatic washing machines, etc.



In Dallas ... 3 machines bury refuse at 5 widely-separated landfill dumps

Two 7-yard D Tournapulls and a Tournatractor, handling refuse disposal in all parts of the city, have proved invaluable to the Dallas (Texas) city management.

"These rubber-tired machines never have to wait for trailer transport," says Operator L. F. Keeler. "They get around to our 5 garbage-disposal areas fast under their own power."

Although the 5 sites are located as much as 15 miles apart in the city's outskirts, the 28 mph Tournapulls and 17 mph Tournatractor quickly drive job-to-job over city streets, often through heavy traffic.

Cover refuse delivered by over 145 trucks

At each dump, units excavate pits and stockpile material for cover. They also doze and compact refuse, blanket each day's collection of

rubbish with earth, and grade and compact the final 2-ft. cover of topsoil. Daily cover eliminates unpleasant odors, fly and ratbreeding, and other nuisances of an open dump.

Superintendent of Sanitation G. C. Brinkley says: "I couldn't get along without these 3 LeTourneau-Westinghouse rigs. It would take 6 track-type tractors to replace them."

Less than 1/3 maintenance costs

Officials estimate maintenance of the rubber-tired equipment costs less than 1/3 as much as maintenance of track-mounted equipment.

Operator C. B. Wilson, who has run Dallas' first Tournapull since its purchase in 1951, says, "In all the time we've had this rig, it has needed only a few minor repairs! Its engine has needed no repairs. It costs little to run. And, it's easy to operate, too!"

All 3 units are still using original tires, which city officials say are in good condition.

Consider what faster job-to-job moves, plus less time for repair and maintenance, can mean on your landfill work. Get all the facts. Write or call us anytime!

Tournapull, Tournatractor—Trademark Reg. U.S. Pat. Off. DPT-810-P-2



Pushed 50 ft. by the Tournatractor, D Tournapull excavates pit where garbage will be buried. Load time in this clay-shale: 40 seconds. Stockpiling excavated material to be used as cover for refuse, Tournapull completes a 600' cycle in 2½ minutes. Output per machine averages 21 loads (105 pay yds.) per 55-min. hr. Pits are usually dug 10 ft. deep.

**LeTourneau-
WESTINGHOUSE
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Peoria, Illinois

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Philadelphia Panorama

PORTRAYS CITY'S FUTURE

THE LARGEST permanent city planning display in the United States, the Philadelphia Panorama, has been opened to visitors at the Commercial Museum, part of the Trade and Convention Center in Philadelphia. Costing more than \$250,000 and occupying 15,000 square feet, the exhibition uses dynamic display techniques and latest devices, including three-dimensional models, integrated sound and shifting illumination, to inspire the hundreds of thousands of visitors annually with new pride and enthusiasm for the future of the Philadelphia region.

The Philadelphia City Planning Commission, the official agency of the city charged with the task of planning and guiding the future of Philadelphia, is responsible for the displays and their content. The Citizens' Council on City Planning, a private, non-profit civil agency devoted solely to citizen education and action in city planning, is responsible for the program and the use of the exhibition by the schools and the community. The third sponsor is the Board of Trade and Conventions, the official city agency charged with the promotion of business and convention activity in Philadelphia. It will maintain and house Philadelphia Panorama in its Commercial Museum.

The most elaborate display in the entire exhibition is a model (50 feet to the inch) of Downtown Philadelphia in which separately spot-lighted panels flip over automatically to show proposed improvements as a synchronized commentary describes the changes.

Another feature is the Diorama, showing in three dimensions how the Philadelphia Area may appear in 1982—if proposed city planning programs are realized. This ultra-modern display not only serves to stimulate the imagination, but also to emphasize that the future development of Philadelphia must inevitably extend beyond the city boundaries to merge into the general geographical setting. This, of course, is in keeping with the modern trend toward comprehensive planning on a regional scale.

Redevelopment and Housing are represented by models of North Philadelphia areas and by a full-sized rowhouse backyard, showing many ways in which a homeowner can find a pleasant spot for relaxation.

Another section reports on the economy of Philadelphia and the activities of the city's Department of Commerce, which operates the Port, the Airports and an Economic and Industrial Development office. Graphic devices point up employment force, skilled labor pools, port tonnage and the number of industries.

In the center section of Philadelphia Panorama, five large panels show, through sculptural and graphic devices, the five factors that involve a citizen of Philadelphia, namely: (a) The citizen in relation to the people of Philadelphia; (b) his housing and his immediate environment; (c) where he works, his office or factory space and his relationship to the trade and industry of the city; (d) where he plays, showing the recreational facilities;



● THESE large aerial views indicate location of future city improvements.

and (e) how he gets to and from these various places; in short, a description of transportation in the city.

A huge four-section, photo-mosaic map of the city, actually an historical document, shows the improvements made in the city since 1947. Superimposed symbols demonstrate the 1956-61 Plan for improvements. These models will be kept up to date by the City Planning Commission.

By illustrating so graphically just what is being planned for Philadelphia in the way of improved housing, commerce, industry, transportation, community facilities and recreational areas, Philadelphia Panorama vividly contrasts the old, inefficient way of "growing like Topsy" with the modern stage-by-stage city planning so necessary to guide us toward a well integrated community of the twentieth century.

● HUGE COPPER hand, 20 feet high, is symbol for Philadelphia Panorama and greets visitors at exhibit entrance.



● GIANT SCALE MODEL of Downtown Philadelphia has separate panels that flip over to show proposed improvements.





Which town will he choose?

Good street lighting is good civic advertising. Both industry and commerce are favorably attracted to a well-lighted community. In fact, one progressive mid-western town found that its rate of industrial growth climbed 75% above the state average after it installed a modern street lighting system.

Trade, too, is attracted by light. Cheerful, well-lighted streets attract more shoppers . . . and put

them in a buying mood. Local residents suddenly do more local shopping; more out-of-towners are attracted to do business in the well-lighted city. And finally, good lighting is bound to raise and stabilize real estate values in your important downtown areas.

Good street lighting is good business . . . it's the best promoter your community can have.

"Out of Darkness," a new, dramatic film story of how one community met its street lighting problems, is now available to civic groups, community service organizations, etc. This 16-mm, sound, black and white movie runs 26 minutes. Borrow a print of "Out of Darkness" from your nearest G-E Apparatus Sales Office.

Section N-455-11

**Outdoor Lighting Department,
General Electric Company, Schenectady 5, N. Y.**

Please send me a free copy of the 24-page bulletin, "Light the Way to a Better Community," GEA-6047.

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PUBLIC WORKS DIGESTS



THE SEWERAGE AND REFUSE DIGEST

Composting Garbage and Sludge

A fully automatic mechanical plant for disposing of garbage, known as the Dano-Bio Stabilizer, was developed in Copenhagen. It has been adopted for an installation in Switzerland, and in 1955 a plant was put in operation in Edinburgh, Scotland. Garbage and refuse are placed in one end of a long, slowly revolving drum. Air is blown into the drum throughout its entire length to maintain aerobic conditions, and a temperature of 100° to 130° F is produced by the fermenting action. A grinding effect is produced entirely by internal friction. The material is so treated for 3 to 5 days, during which it moves slowly to the discharge end of the drum. Here it is screened into two products, a fine compost, and tailings which are now inoffensive and can be sorted under hygienic conditions. The moisture necessary for fermentation is maintained in the drum by mixing liquid primary sludge with the refuse as it is placed in the drum.

In the Edinburgh plant the treated material is carried from the drum to a vibrating screen by a belt conveyor, on which the metal scrap is sorted out, and the remaining inert material is burned in an incinerator. The fine screened material is suitable for use as a fertilizer without further treatment. This plant has a capacity of 20 tons of crude refuse per day plus 150 gallons of sewage sludge per ton of refuse, and produces some 14 tons of compost which is readily sold to farmers and gardeners. The plant is operated by one man.

"Mechanical Composting of Garbage and Sewage Sludge." By John Grindrod. PUBLIC WORKS, June.

Sewage Treatment at Turnpike Service Stations

The author describes treatment installations for restaurants and service stations on the Pennsylvania

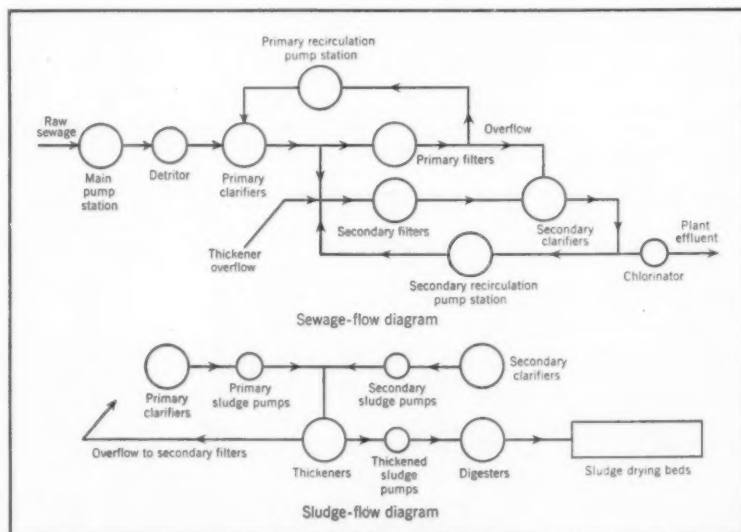
Turnpike and the Garden State Parkway. Settling tanks and intermittent sand filters dosed by rotary distributors have proved unsatisfactory. The sewage is fresher and more concentrated than normal domestic sewage; is almost entirely human and kitchen wastes, with high content of grease and synthetic detergents. A typical analysis of sewage from service areas shows approximately 500 ppm of BOD, 300 ppm suspended solids, 130 ppm grease, and 350 ppm commercial detergents. The treatment adopted for these plants is believed to be unique in that the comminuted sewage passes first through a two-story digester-clarifier and then to trickling filters. Where two-stage biofiltration is used, the clarifier portion is divided by a vertical partition into primary and secondary compartments; and two filters are produced in one circular basin by placing a circular wall which separates an outer annular space from the inner space, the same rotary distributor dosing both filters. The filter effluent is

chlorinated. Fresh, aerated liquor from the filters is returned continuously to the clarifiers so that they are kept fresh and free from septic action. Analyses at three of these plants showed a final effluent with 14 to 19 ppm of BOD.

"Turnpike Sewage Treatment Plants." By G. Gale Dixon and Herbert L. Kaufman. *Sewage & Industrial Wastes*, March.

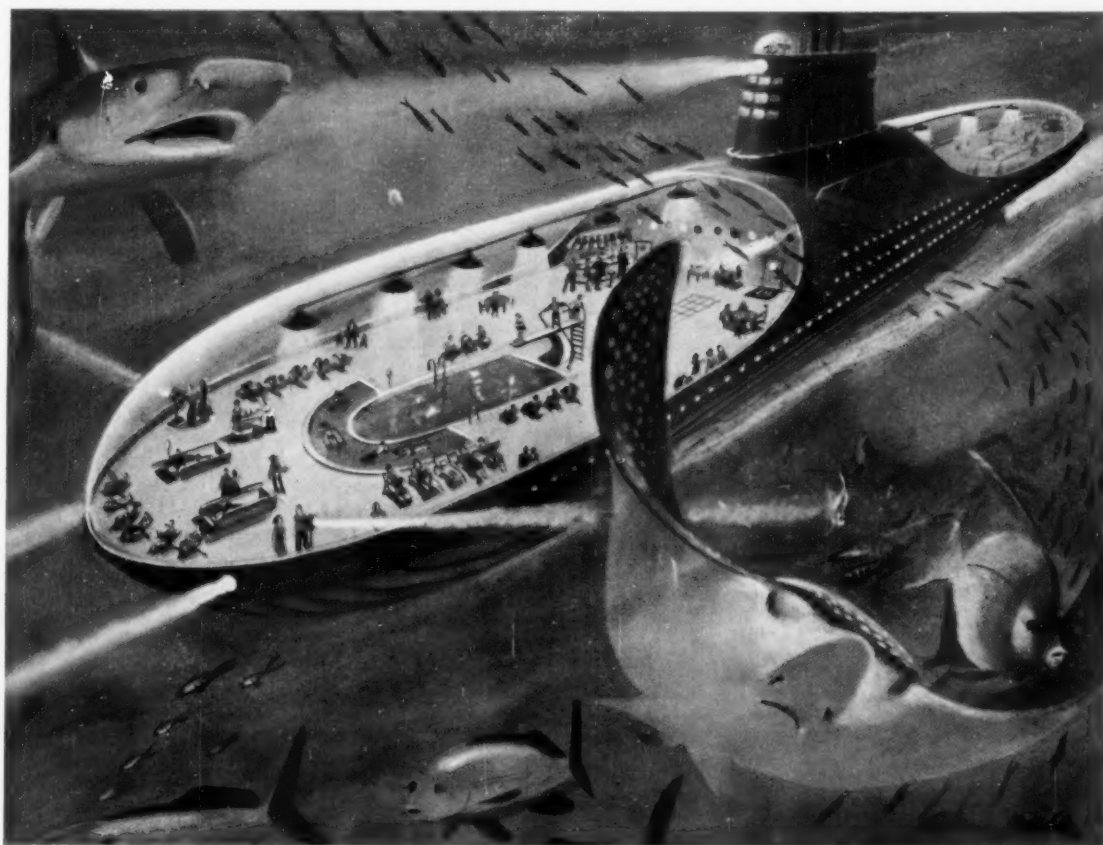
Sludge Thickening at Beaumont, Texas

Beaumont in June, 1955, put into operation a treatment plant of 30 mgd capacity which included a new sludge thickening process, the object of which was to reduce the digester capacity needed and thereby the cost. There resulted a saving of \$175,000 in construction cost. The thickened sludge has averaged 8.7 percent total solids and 52 percent volatile solids. The thickening process has resulted in no deleterious operating characteristics in other plant units. The thickener overflow is discharged to the secondary fil-



Courtesy Civil Engineering

● SEWAGE and sludge flow diagrams, Beaumont, Texas, sewage treatment plant.



HUGE submarine liners with glass capable of withstanding tremendous pressure may offer the traveler of the future intimate glimpses of life under the sea and immunity from storms and seasickness.

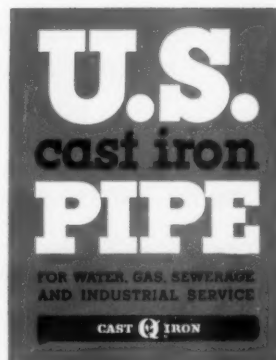
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WE MAY SIGHTSEE UNDER THE SEA!

The world of the future—full of amazing, time-saving, health-giving products and machines. Still being used, however, will be the reliable cast iron water and gas mains laid today.

Records show that over 60 American cities from coast to coast are still served by cast iron water and gas mains laid more than a century ago. And modernized U. S. Pipe... centrifugally cast, quality-controlled from mines to finished product... is extra rugged, more dependable than ever.

U. S. Pipe is proud to be one of the leaders in a forward-looking industry whose service to the world is measured in centuries.



U. S. PIPE AND FOUNDRY COMPANY, General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

PUBLIC WORKS for July, 1956

ters, and has no detrimental effect on the removal of BOD by them. The Beaumont plant includes two 50-ft. thickeners supplied by Dorr-Oliver, Inc.

"Sludge Thickening Proves Economical in Beaumont, Texas, Sewage Treatment Plant." By Joe Dust, Supt. of plant. *Civil Engineering*, April.

Tracing Sewage Discharge in the Ocean

In tracing the direction taken by sewage effluents discharged into the ocean, use has been made of floats,

visual observation of sleek, and chemical analysis of samples of the ocean water taken at numerous points in the possible path of the effluent. The movement of sleek is determined largely by the wind; floats are moved by both wind and tidal currents; the results of the chemical and bacteriological analyses of samples of the water are not known for several days. A method using radioactive tracer materials was tested in England, by the Atomic Energy Research Establishment, at the same time as the other methods named, to compare the re-

sults. The tracer material used was ammonium di-hydrogen phosphate, dissolved in hot water and poured into the sump of an outfall pumping station. Geiger counters carried in a boat readily detected the presence of the tracer materials when close to them, but it was possible to pass within a few yards of them and be unaware of their presence.

"The Use of Radioactive Isotopes and Characteristic Bacteria in Tracing Sewage Pollution in the Sea." By H. B. Cochrane. *The Surveyor*, April 21.

Stream Assimilation Of Sewage Pollution

The decrease in DO concentration, from a point in a stream just upstream from pollution to the low point on the oxygen sag, is related in some way to (1) the quantity of pollution introduced, (2) the temperature of the river water, and (3) the amount of flow in the stream available for dilution. The author describes a method of determining the DO drop from consideration of the combined effect of these variables. This method does not require obtaining data on time of water travel, or intensive surveys involving large field and laboratory crews.

"How Much Pollution Can a Stream Assimilate?" By M. A. Churchill, of the Div. of Health & Safety, Tennessee Valley Authority. *PUBLIC WORKS*, June.

Determining Flow in Basins by Use of Radiotracers

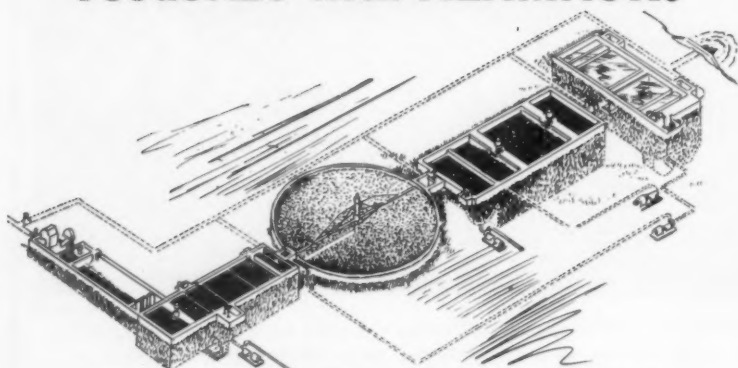
This article describes the use of radioactive potassium 42 as a tracer for the purpose of measuring the detention time of a liquid in a settling basin. A great variety of radioisotopes is available, and many types of counting and recording equipment may be bought or made. It is possible to devise tests to answer the many varied questions which arise in studying sewage and water system problems; for which purposes the use of radioisotopes commends itself as a valuable tool.

"Settling Basin Detention Time by Radiotracer." By William Seaman, of American Cyanamid Co. *Sewage & Industrial Wastes*, March.

Other Articles

"The Composition of Residential Garbage". Monthly average composition throughout the year at East Lansing, Mich. By George F. Mallison, of USPHS, and William F. Hohloch, of Genesee Co. Health Dept. *PUBLIC WORKS*, June.

why suffer MUNICIPAL WASTE MALODORS? reodorize with ALAMASK®



The use of ALAMASK reodorants creates a new approach to solving air pollution problems due to the handling and disposal of solid, liquid and gaseous wastes. At very low cost, ALAMASK can be used to achieve either a masking of the malodor created by municipal waste or creation of a condition that results in a non-objectionable odor.

ALAMASK has also proved its effectiveness in the abatement of objectionable odors emanating from

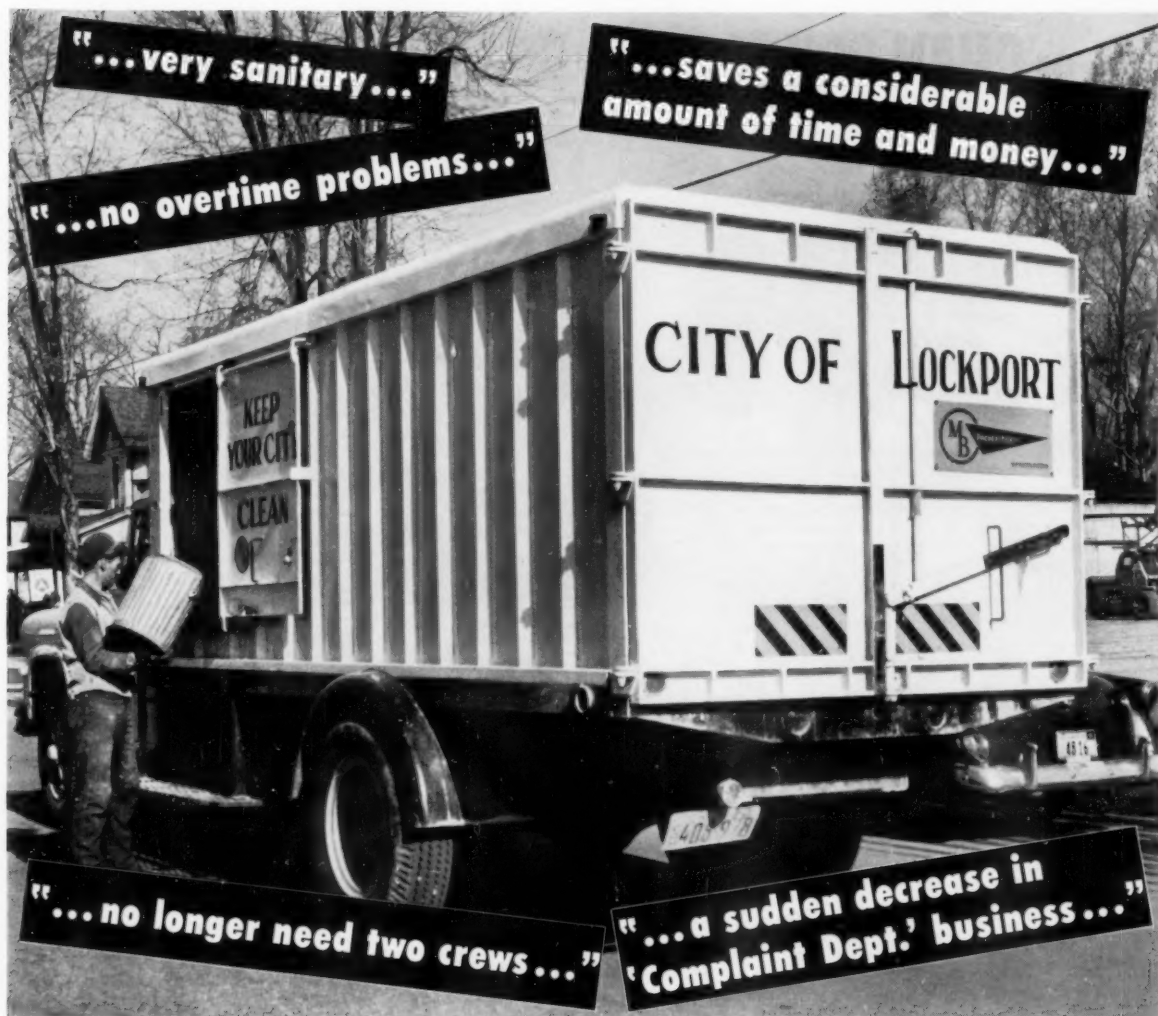
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LOCKPORT, N. Y. SAVES TIME AND MONEY WITH 16 Cu. Yd. M-B PACKER BODY

Superintendent of Streets Ralph C. Loomis reports:

"The purchase of the M-B Packer unit made it possible for the City of Lockport, New York to save a considerable amount of time and money. The route that this unit travels on is about 20 miles long. There are 895 stops along this route. In the past, before we had the M-B unit, it took two trucks and crews to service the homes along this route. Now, since we have put the new unit to work, we have taken one truck and crew from this route and are ahead of schedule on our street patching program. Thanks to the M-B Packer unit, we no longer need two crews for this route or do we experience any overtime problems. There is one more thing that I would like to bring out. The closed body of the unit cuts down the dust one hundred per cent and makes things very sanitary for the employees that work with this truck. Needless to say, the 'Complaint Department' has noticed a sudden decrease in business."



In big cities and small . . . all over the country . . . sanitation experts like Mr. Loomis have been praising the speed, simplicity and safety of M-B Packer Bodies. You can have fast, efficient refuse collection like Lockport, N. Y., and at amazingly low cost. Investigate all of the many M-B Packer benefits. Call your M-B distributor for a comparison demonstration or write for full details and prices.

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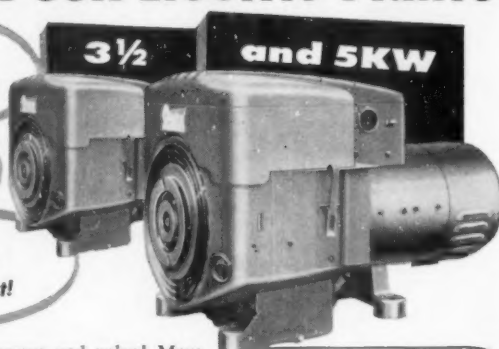
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**MORE
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Way ahead in performance and value! More powerful, two-cylinder, air cooled Onan gasoline engines of 4-cycle, horizontally-opposed design give smooth, quieter, effortless performance. Short stroke and moderate speed cut engine wear, give longer life. Quality features include rotating Stellite-faced exhaust valves, solid Stellite valve seat inserts, full pressure lubrication. Onan's exclusive Vacu-Flo cooling system available for difficult or "buried" installations.

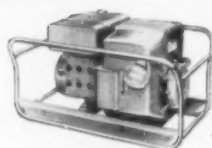
Completely Onan-built, with Onan gasoline engines direct-connected to Onan all-weather generators in compact, rugged units. Available in stationary, portable and standby models with a wide range of accessories.

Write for folder on all CCK models



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3686 University Avenue Southeast, Minneapolis 14, Minnesota



PORTABLE MODELS

Available with carrying frames or 2-wheel dollies. Easily portable. Other Onan portable models: 500 to 10,000 watts.

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then you can profit
by the experience
of thousands of
Mark-Rite users

Look for the vertical paint tank; it can be removed for easy cleaning.

See that it has a quick-release tank cover for rapid reloading.

Be sure that the paint gun is at the pivot point of the machine so it will maintain line width on turns.

Make sure that the marker can paint within 1/8" alongside fixed objects and can paint crosswalks to within 3" of the curb.

Check to see that it has an automatic type gun which will handle any type of paint, including heavy-bodied pre-mixed, beaded paint.

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424 West Redondo Beach Boulevard, Gardena, California

"New Pollution Control Formula" established by the California State Water Pollution Control Board for Los Angeles sewage treatment. Engineering News-Record, May 10.

"Jacksonville's (N.C.) Sewage Treatment Plant". By A. C. Turnage, City Eng'r. Water & Sewage Works, May.

"Prefabricated Catch Basin Sections Save Time and Money". By A. J. Mair. Public Works, June.

"Financing an 18-mile Sanitary System" in Catasauqua, Pa. Public Works, June.

"Effect of Garbage Grinding on Sewers and Sewage Purification." Report of English Institute of Sewage Purification. Contractors Record, April 25.

"Chromatographic Determination of Volatile Acids". By H. F. Mueller, A. M. Buswell and T. E. Larson, of Illinois State Water Survey. Sewage and Industrial Wastes, March.

"High-Rate Trickling Filters in Germany". Theories and practices, some of which differ from those of the U. S. (10 to 12 ft. depth, multiple-arch filter bottoms, intermittent dosing). By Adolf Rumpf. Sewage & Industrial Wastes, March.

"Sewage Disposal and Waste Treatment in Canada." By J. R. Menzies, Chf., Dept. of National Health & Welfare. Sewage and Industrial Wastes, March.

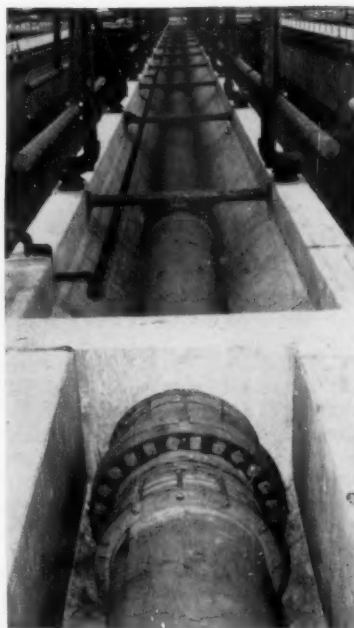
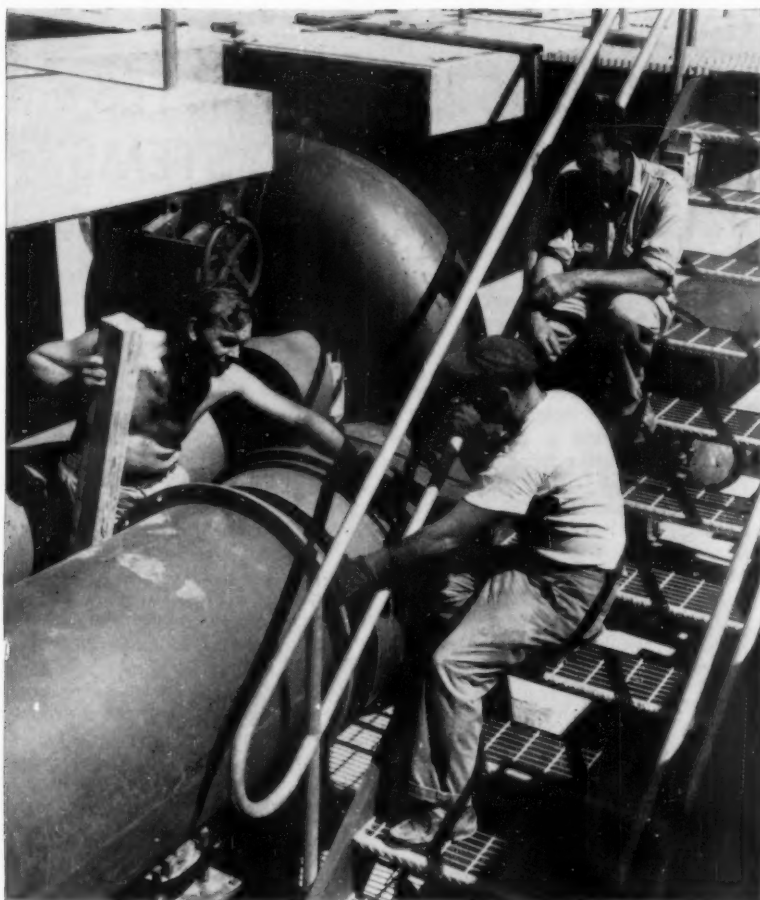
"Sewers for Rhode Island's Blackstone Valley." By Francis A. Obert. Public Works, June.

Incinerator Research Program

The Incinerator Institute of America started on June 1, 1956, an incinerator research program with New York University through its College of Engineering Research Division, in New York. In the early stages, the program will concern itself with a complete analysis of research undertaken individually by members of the Institute and a survey of all other available research information on incinerators. With this knowledge and the outline as presented in the proposed Standard Incinerator Code, specific projects will be undertaken on the basis of importance and immediate feasibility.

Memo From Maryland . . .

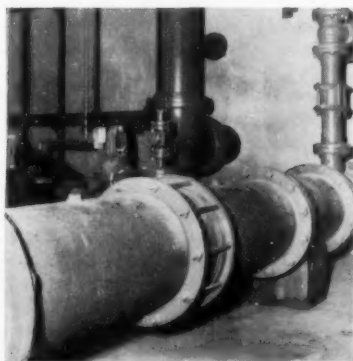
"You can be fined as much as \$250 dollars or sentenced to jail for as long as 90 days, or both, if you are found guilty of throwing trash on Maryland highways. Keep a clean car and a clean highway by carrying a litterbag in your car to hold your travel trash until you can dispose of it properly. Obey the law and help keep Maryland beautiful!"



Workmen (left) adjust follower rings before inserting bolts on a 30-inch Style 38 Dresser Coupling. It's the air line leading to the main settling tank in Miami's Virginia Key Sewage Disposal Plant. Steel and cast iron pipe meet in a Style 62 Dresser Reducing Coupling on aeration tank air line (above).

Quick-change Act for Miami Disposal Plant

Steel pipe and Dresser Couplings provide easy access, system flexibility



Dismantling for maintenance looks and is easy with a Dresser Style 38 Coupling. This one joins a low flushing water line in chlorinator building. Another Style 38 is on the vertical line at upper right.

Miami Sewer Project Associates designed the new Virginia Key Sewage Disposal Plant at Miami, Florida, for high reliability and convenient modification.

They sought easy dismantling of permanent aeration lines so maintenance and repair of equipment could be performed quickly. They also wanted an easy way to dismount and set up dewatering lines in new positions as required.

Dresser Couplings were chosen as the ideal answer to this common disposal plant piping problem. They went in quickly, easily and accurately — five precision-made parts, plus required bolts, reduce all pipe joining to a simple mechanical operation. Installations require only a wrench . . . average joining time, two man-minutes per bolt. And they're easy to install in tight places.

Dresser Couplings are a "must" for dismantling purposes. Removal is as easy as assembly . . . and all coupling parts may be re-used in the new piping setup. And, most important in any sewage disposal project, they remove strains on pumps and valves.

Proved in use for more than 60 years, no pipe joining method provides all the Dresser advantages . . . 100% tight, permanent, flexible, simple, fast and economical. Send for complete information about Dresser applications on water, sewage, and industrial waste projects. Write Dresser Manufacturing Division, Bradford, Pa. Sales offices in: New York, Philadelphia, Chicago, S. San Francisco, Houston, Denver, Toronto, Calgary.



LEGAL ASPECTS OF THE DISCHARGE OF INDUSTRIAL WASTES INTO MUNICIPAL SEWERAGE SYSTEMS

JOHN T. MORRISEY
General Counsel
League of Municipalities
Raleigh, N. C.

*A paper presented at the Fifth
Southern Municipal and Industrial
Waste Conference*

THIS SUBJECT of discharge of industrial wastes into municipal sewerage systems is but a single facet of a serious and growing problem and it is essential to a proper understanding of the subject that it be placed in the context of time and events.

In 1951, the State of North Carolina instituted a water pollution abatement program by the creation

of the State Stream Sanitation Committee within the State Board of Health. The Committee was charged with the duty of classifying all river basins and tributaries according to their most beneficial use and was granted power to issue orders requiring all users of the rivers and streams to treat sewage and waste, after classification, in order to meet and maintain the standards established.

At the present time, two river basins have been classified and it is contemplated that all river basins in the state will be classified and pollution standards established by 1960. The scope of the problems faced by municipalities in attempting to comply with future orders of

the Committee may be realized by a mere statement of facts:

There are 284 municipal sewerage systems in North Carolina which use rivers and streams for disposal purposes; 86 of these municipal systems do not at present provide any treatment for their sewage and waste. Of the 198 municipalities that now provide some treatment, it is conservatively estimated that 75 per cent, or about 150, must build new plants, or enlarge or improve existing plants under the State program. This estimate is based upon a finding that in the first river basin classified in 1955, 90 percent of the existing plants were not adequate to treat wastes to meet the classification standards. Therefore, some 236 municipal sewage treatment plants must be built, improved or enlarged in North Carolina by 1960 or within a few years thereafter!

Such is the background, the context of time and events against which we discuss the legal aspects of the discharge of industrial wastes into municipal sewerage systems.

Municipal Powers

All powers of a municipal corporation in North Carolina are derived by grant from the State Legislature. By general statute, municipalities are granted power "to acquire, provide, construct, establish, maintain and operate a system of sewerage for the city, and to protect and regulate the same by adequate rules and regulations." (G. S. 160-239)

This grant of power makes no distinction between industrial wastes and other municipal sewage. However, our Supreme Court has held that when a municipality permits industrial wastes to be discharged into its sanitary sewer system, they lose identity as industrial wastes and become municipal sewage. By such integration the municipality assumes any potential liability for nuisances created by operation of its sewerage system even though the industrial wastes may be a principal contributing factor. It is said that the test of liability is the power of control and municipal ownership means municipal control, for the supervision and regulation of sewers involves the exercise of the police power in the protection

Caterpillar Holds Open House



● EXECUTIVES of Caterpillar Tractor Company, Harmon S. Eberhard, President, and C. A. Woodley, Vice President (right) were among the representatives of the host company at the open house.

Since institutions remain the lengthened shadows of men, we show above the pictures of two of the many such men of Caterpillar Tractor Company.

Lewis C. Morris was among those from PUBLIC WORKS invited to the mammoth open house press party and demonstration put on by Caterpillar at its new multi-million dollar plant for building rubber tired motor graders and wheel tractors, in Decatur, Ill., recently. On exhibition also were the full line of track-type tractors and an outstanding movie on "Quality Control."

Equally as impressive as the

buildings and equipment was the address of President Harmon S. Eberhard. He spoke of the growth of the Caterpillar company as being based on the world's growing population and all the human needs arising from it. As one example he pointed out that our own highways are now carrying 55 million cars and trucks, 72 percent more than in 1940. While births in the United States alone each week would populate a city the size of Decatur, feeding still further the pressure for more and better machines to do the world's increasing volume of work.

of the public health and welfare and the police power cannot be bargained or granted away.

In exercising the power thus granted, a municipality may permit any appropriate use to be made of its sewerage system and may fix reasonable conditions for such use. No one has a vested right to use a city's system nor can a city grant such right. In the exercise of its discretion, a municipal governing body may grant such licenses or permits to make connection with, or use of, its sewerage system as may be warranted by the capacity and ability of the sewers and disposal plant to carry and dispose of sewage, and as the public interests may require.

The statutory authority of a municipality "to protect and regulate its system by adequate rules and regulations" is usually exercised by ordinance.

Where an ordinance makes no distinction between industrial waste and domestic sewage, the provisions thereof apply with equal force to each type of waste. In the past, the great majority of municipal ordinances in North Carolina made no such distinction. However, at the present time, the trend is toward distinction, and it is anticipated that in the near future, all such ordinances will not only make the distinction but will contain specific provisions for industrial wastes.

The ordinances now in force relating to sewerage systems vary in their provisions. Some ordinances simply prohibit the discharge into the city's system "of any substance likely to obstruct or cause undue injury to the system or any substance of such high causticity or of a sufficiently acid nature or any liquid or waste whatsoever that interferes materially with the proper treatment of sewage in the city's treatment and disposal plant."

Other ordinances enumerate specific substances and prohibit the discharge of such substances into the system.

A few ordinances, more common in the larger cities at the present time, are specific and detailed, making definitions, fixing standards, requiring certain structures, controlling volume and rate of discharge, providing for inspection and testing, and either requiring pre-treatment or levying surcharges for treatment of industrial wastes.

In addition to regulation by ordinance, municipalities resort to contract arrangements with particular industries whose waste is of such character as to require special provisions. The most vivid manner in

which to bring to your attention a full and rounded picture of the legal aspects of an industrial sewage disposal contract between a city and a private company is by relating an actual case.

This case was decided in South Dakota in 1944 and is a "leading case", having been cited and quoted with approval in subsequent cases and legal journals; and it represents the majority opinion throughout the country. The contract provisions are a model of cooperation between industry and municipal government. All will be interested in the court's decision. The case is *Ericksen v.*

City of Sioux Falls, 14 N. W. 2d 89 (1944).

The action was brought by a taxpayer against the city, its governing board, and the industry, John Morrell & Company, a meat-packing plant, to have an industrial sewage disposal contract between the City and the Company declared invalid and to enjoin further use of the city's sewerage system and disposal plant for disposal of the company's industrial sewage.

The city is the largest in the state, 1940 population of 40,000; the company is the largest industry in the city and its sewage constitutes the

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YOUR FILTER FLY PROBLEM with . . .

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- HARMLESS TO BACTERIA
- HARMLESS TO ALGAE
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- DOES NOT AFFECT SNAILS

Beneath the rocks of most trickler filters are billions of noxious filter flies. The larvae are a potential menace to all trickler filters . . . the adult fly is a health and sanitation problem in your city.

GREAT NEWS FOR CLOGGED SEWER LINES!

ND-25

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SOLVEX is a highly concentrated chemical produced by National Disinfectant Company Scientists for controlling objectionable odors found in and around sewage plants, land fill areas, lift stations, drainage ditches, storm sewers and city dumps. Solvex will not affect the bacteria in your system. Solvex even controls hydrogen sulphide (rotten egg) odors. Use a petcock on a container of Solvex to slowly drip the chemical at or near the area where the odor is at its worst. A little goes a long way.



Former attempts to remove the filter fly included dangerous bacteria-killing chlorination or expensive time-consuming water flooding. After years of research, National Disinfectant Company Scientists have proven Psycon a safe liquid chemical which will assure almost 100% kill of the larvae and pupae, as well as the adult filter fly. Psycon has no effect on snails or B.O.D. values. It is harmless to algae and bacteria in your sewage plant.

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- ☐ Send more information on ND-25
- ☐ Send more information on SOLVEX
- ☐ Have representative call

Name

Address

City State

NATIONAL DISINFECTANT CO.

2417 Commerce Street Dallas, Texas



Automation for Parking Lots

THE WORLD'S LARGEST automation parking operation affords "off-street parking at a minimum cost," says H. S. Strong, manager of Veterans Memorial Auditorium, Des Moines, Iowa. Eight electrically operated gates made by Western Railroad Supply Company control access to the four parking areas which provide space for a total of 521 cars.

To use the parking lot, a motorist drives up to a gate and, without getting out of his car, deposits the

required fee into the remote control box. Immediately the gate arm rises and allows the car to enter the lot. The gate arm then returns to its horizontal position to await the admission of another car. Each of the pay-in, free-out gates incorporates a magnetic detector buried in the exit driveway. As an exiting car passes over it, the magnetic detector actuates the gate arm and allows the car to depart.

The two gates at each lot tabulate the number of cars entering and

leaving. When the balance equals the lot's capacity, an illuminated "Lot Full" sign pops up. Another remote control will return coins inserted by any motorist who overlooks or disregards this message.

According to the Auditorium manager, the expense of attendants would be prohibitive during non-rush parking. When major events attract capacity crowds, attendants handle parking direction and collect fees in supplementary adjacent lots, but the automation lots keep right on working alone during the rush period, collecting fees and admitting automobiles.

greater part of all industrial sewage; its disposition requires a large part of the total capacity of the disposal plant. The Court said "this case involves no ordinary situation."

The Company and the City entered into a contract in 1926, in contemplation of the completion in 1927 of a sewage disposal plant by the City. Under the contract, the Company agreed to install suitable equipment for the fine screening, sedimentation and grease skimming of all the Company's sewage before entering the City's mains; further, that the Company would pay its pro rata share of the cost of pumping its sewage and a part of certain fixed and operating charges. The contract had no time limit; hence, either party could cancel it at will after reasonable notice. The parties operated under this contract until 1940 when a new contract was written.

In 1939 the disposal plant ceased to function and the City and the Company jointly engaged the firm of engineers who had originally designed the plant to make a survey and recommendations for repair and improvement of the plant. The engineers reported that the filter beds were clogged, due to the presence of too much fine stone in the filter bed and the presence of grease in the sewage which had coated and clogged the beds, which grease was due to the industrial wastes. Other serious problems had also developed. Both the City and the Com-

pany had expanded and both were threatened with suits for the pollution of the river which occurred when the plant ceased to function. The terms of the new contract were as follows:

1. That in consideration of certain payments and expenditures to be made by the Company, the Company was granted the right to send into the sewer system and disposal plant of the City, all of its pretreated sewage for a period of 15 years.

2. The Company agreed to pay 75 percent of the total cost of rehabilitation of filters in the disposal plant, amounting to \$11,250.

3. The Company agreed to install degreasing equipment in the disposal plant at its own expense, \$3,625.

4. The Company agreed to pay 85 percent of the total cost of purchasing and installing an equalizing tank, \$10,625.

5. The Company agreed to purchase for installation in the disposal plant a gas engine-driven blower and generating equipment and appurtenances at a cost of \$46,900.

6. That the total cost of such payments should not exceed \$70,600.

7. The Company agreed to pay quarterly to the City, as part of the operating expenses of the disposal plant, \$2,500, or \$10,000 annually.

8. The City agreed to maintain and keep in operation the disposal plant during the entire term of the

contract at its own expense, provided, that if improvements and betterments to the plant should be required, the Company would pay 25 percent of the cost, not to exceed \$45,000; and further, that should mechanical replacements become necessary, the Company was to pay 50 percent of yearly cost of replacements not to exceed \$735 annually.

In its decision the Court stated the question thusly: "Did the city have the power to enter into this contract?" In answering this question the Court reviewed the pertinent state statutes, which are substantially similar to those of North Carolina, and also the applicable legal principles as follows:

By state law the City is vested with police power to preserve the public health and welfare and the proper disposal of sewage is essential to the public protection.

Where the state law expressly confers upon the city the power to regulate the use of sewers, and neither defines the limits of that power nor prescribes the manner of its exercise, the City is necessarily invested with power to exercise its discretion, and the courts will not interfere with such action unless it appears to be unreasonable or arbitrary. However, the courts will always interfere to keep municipal authorities within the law and will interpose to prevent any action which is ultra vires because of some lack of antecedent legislative authority.

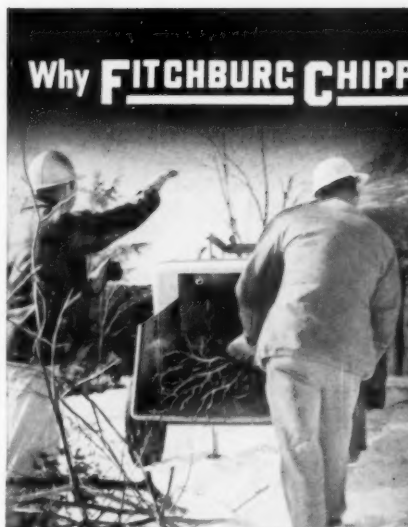
A municipal corporation is a creature of the Constitution and laws of the state. It possesses only such powers as are granted to it, together with those incidental or implied powers as are necessary to enable it to perform its authorized functions. A city, as such, has no inherent powers and none of the attributes of sovereignty and the policy of the law is to require of municipal corporations a reasonably strict observance of their powers.

The only privilege which a City can grant to a person or firm regarding use of its sewerage system is a license or permit to make proper connection and empty sewage into the system, there to receive such treatment and disposal as the City may from time to time provide, and it has no power to guarantee the successful operation of its disposal plant or sewerage system.

Where the city's plant must be closed for repairs, or fails for any reason to receive or adequately treat sewage emptied into it, the City cannot be held liable for resulting damages to any person whose sewage is thereby inadequately treated or excluded; and hence cannot, by contract, assume any such liability or bind itself to receive and dispose of all sewage which users may attempt to empty into its sewers.

Any license or permit to connect with the city's system must be contingent on the ability and capacity of the system and plant to digest and dispose of the licensee's sewage. No one has any vested rights in use of the city's system, nor can the city grant such rights, for a city's police power cannot be bargained away by contract, but control must be retained at all times.

The contract in this case, whereby the city granted the right to the company to empty all of its industrial sewage into the city system, without limitation as to character or volume, for a period of 15 years, was ruled invalid as exceeding the city's authority. The Court said that the contract purports to grant far more than is embraced in the license or permit which the city is authorized to grant; the contract attempts to grant a vested right for 15 years; this it cannot do. The mere fact that one has expended considerable money to make the connection gives him no vested right to retain the connection; however, as the City suggested in its brief, the money received from the Company under the contract, may be retained as voluntary contributions in the understanding that neither past nor



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Saves You Labor

Read what users say. From a Missouri utility line clearance firm: "One man can operate the chipper with ease. He alone can handle as much and more brush in the same length of time as could two men loading brush on a platform body." From a Connecticut tree expert: "This chipper has cut our brush disposal in half. It has eliminated brush dumps and fires completely." One large Ontario power customer reports a saving of 25% in man hours expended per tree as a result of equipping their crews with Fitchburg Chippers.

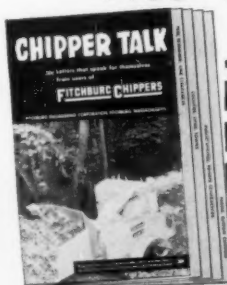
Increases Your Production

In Oregon the Roadmaster for one county said: "This Fitchburg Chipper has paid for itself twice over the first season." Another chipper user on Washington State Highways reports that with a crew of three men they can clean up at least a half mile of heavy brush in six hours. A Missouri utility line clearance firm says: "Our figures show that production has been increased by a good 25% with a Fitchburg Chipper."

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Read what satisfied users say. Connecticut: "The Fitchburg Chipper has never cost us one minute of delay." Ohio: "We now have ten of your Fitchburg trailer type chippers. Doing a good job—from the looks of them they will last for many years." New York: "Our men are particularly pleased with Fitchburg Chippers. They are rugged and reliable."

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future payments impose any liability upon the City nor confer any vested rights or supervisory control upon the Company.

Of particular interest were the Court's comments regarding the request for an injunction against further use of the city's system by the Company. The Court held that no injunction would issue; that the matter of use of the city system is governed by license or permit issued in the discretion of the governing body of the City and, further, that discontinuance of the connection would jeopardize the public health or injure the public interest.

One thing more about this decision is the court's repeated reference to lack of legislative authority and the statement that "in the present state of our statutes, we are compelled to hold the contract wholly unauthorized and void." The Court recognized the practical aspects of the problem and, undoubtedly, given adequate legislative authority, the same court would have found little difficulty in upholding the contract.

This case comprises a dissertation on the legal aspects of industrial sewage disposal contracts and it conveys a graphic and pointed les-

son on the merits of cooperation between industry and municipal government; and on the advisability of adequate enabling legislation.

I would like to refer back to the problems faced by our municipalities in constructing the necessary plants, enlargements and improvements in order to meet pollution standards established by the State Stream Sanitation Committee.

A part of the Stream Sanitation law provides that no order be issued against any other person contributing to a polluted condition where enforcement against a municipality contributing to the same condition cannot be had because of operation of law or otherwise. This proviso would shield an industrial polluter in a given situation and indicates an attitude that if all polluters cannot be controlled, then no one polluter should.

The 1955 General Assembly amended the law, presumably to lend impetus to the pollution abatement program, by providing that any municipality under order of the Committee to abate pollution "shall proceed to provide funds, using any and all means necessary and available therefor by law, by issuance of revenue bonds or otherwise, for financing the cost of all things necessary for full compliance with said order and shall thereby comply with said order. . ." Thus, the municipal polluters are placed under compulsion in order to expedite compliance by all polluters.

Of further interest are other items of 1955 legislation which, in brief, grant a 5-year write-off or amortization for income tax purposes to industries undertaking construction of sewage disposal plants and facilities; and, furthermore, exempt such new construction from ad valorem taxation.

These laws indicate a program of Inducement for Industry and Compulsion for Cities. This is not unusual in a State geared and dedicated to a program of industrialization and, if sometimes overzealous, the laudable purposes of such a program would mitigate any incidental errors of judgment.

However, I submit to you that the better approach is not a program of Inducement for Industry coupled with Compulsion for Cities, but rather a program of Planning for Progress through cooperation between Industry and Municipal Government; such a program to be evidenced by the undertaking of joint ventures and cost-sharing where appropriate and desirable under adequate enabling legislation.

FILTER PLANT EQUIPPED WITH MOTOR OPERATED

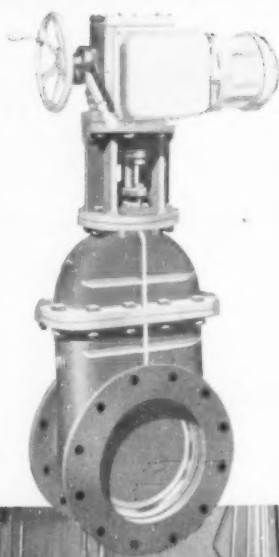
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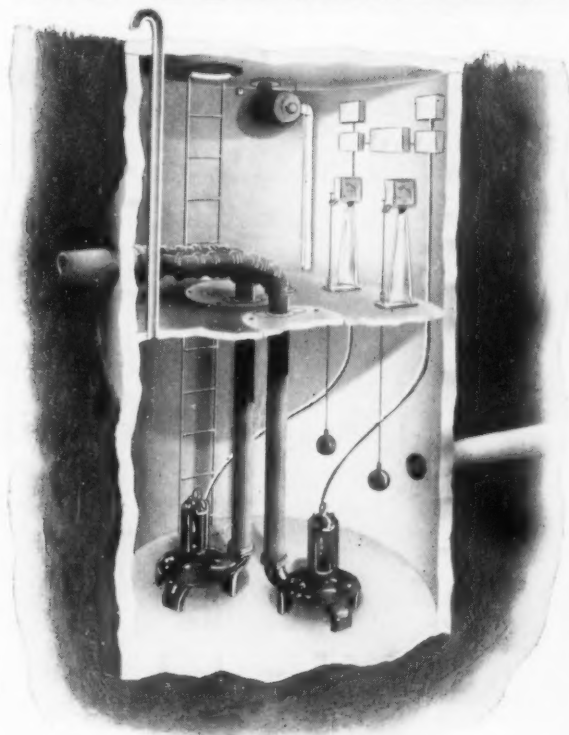
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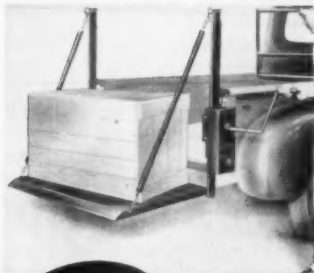
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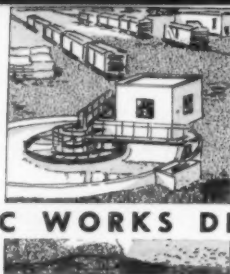
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PUBLIC WORKS DIGESTS

THE INDUSTRIAL WASTE DIGEST

Biological Treatment of Aromatic Wastes

The most common aromatic compound in industrial wastes is phenol which, because of its common use as a disinfectant, is normally excluded from biological treatment. Review of the literature, however, indicates some degree of success with biological treatment of phenolic wastes. It is desired to show how bacteriology can be applied in stabilization of pure aromatic compounds and what interrelationships exist in the metabolism of the common aromatics. This included a study of the metabolism of phenol. Activated sludge was used as the most efficient biological treatment system available for industrial waste disposal. The activated sludge units were started using a synthetic sewage containing glucose; nutrient broth; potassium and ammonium phosphates; sodium, calcium, and ferric chlorides; and magnesium sulfate. This was seeded with settled sewage, and the system was acclimated to the pure aromatic compounds by gradually increasing the proportion of the latter. In nine systems, aromatics used were phenol, o-cresol, m-cresol, p-cresol, benzyl alcohol, mandelic acid, anthranilic acid, benzoic acid, and catechol. Warburg studies were made to determine ability of the various systems to oxidize not only the compound to which each was acclimated but to other aromatics as well. It was concluded that activated sludge is quite well suited for treating phenolic and related aromatic compounds; that these aromatics were not toxic to activated sludge in concentrations up to 500 ppm. phenol; that oxidation of the aromatic compounds was limited by the rate of oxygen transfer and was a function of the chemical structure of the compound; and that oxidation of aromatics appeared to be by beta-oxidation rather than by direct oxidation of the ring structure to catechol.

"Metabolism of Aromatic Compounds by Activated Sludge." By R.

E. McKinney, H. D. Tomlinson, and R. L. Wilcox, Massachusetts Institute of Technology. *Sewage and Industrial Wastes*, April.

Metal Finishing Wastes Treatment

At the Westinghouse Electric Manufacturing Company at Raleigh, N. C., engaged in the manufacture of watt-hour meters and sockets, the metal finishing processes for cleaning and plating use nickel, cadmium, tin, and "bright alloy", which is made up of copper, zinc, and tin. Other processes produce a chromate finish on aluminum and a phosphate finish on iron. The waste is small in volume but is very toxic. The plant discharged 40 gpm of cyanide waste and 160 gpm of other wastes continuously over a 16-hour period. Concentrations of toxic components in ppm included 5.3 of cyanide, 2.5 of zinc, 1.5 of cadmium, 3.1 of tin, 3.1 of nickel, 1.5 of chromium, and lesser amounts of iron and copper. The

problem consisted of preparing the wastes to make them acceptable to the City of Raleigh for treatment with sewage. The City established limits (in ppm.) of 0.1 for cyanide and nickel and 5 for all other components. The pH was expected to be maintained above 7. Consequently, treatment was directed toward reduction of nickel and cyanide. This required complete separation of the acid-alkali waste from the cyanide waste. The treatment facilities consists of two separate units. The acid-alkali wastes are subjected to pH adjustment to 8.5 in a "buffer mixer" through the addition of lime. Here, also, ferrous sulfate is added to precipitate heavy metals and the waste is passed through a sedimentation basin. The cyanide wastes are destroyed by chlorination in an alkaline solution by means of a process which may be operated on a continuous-flow or batch basis. The treated cyanide wastes are returned to the mixing basin for the acid-alkali wastes and

Educational Program Helps Carry Sewer Bond Issue

THE INSTALLATION of more than 40,000 ft. of 12 to 24-inch vitrified clay pipe has given Decatur, Ill., an extensive sewer system, supplying a long-existing need. This program was financed by a bond issue which was supported by such local organizations as the League of Women Voters, The Association of Commerce, The Toastmaster's Club and the Decatur Herald and Review. Newspaper articles, leaflets explaining the needs, and talks at public and association meetings were employed to emphasize the need for and advantages of adequate sewerage. Though a previously proposed bond issue for the same purpose had been defeated, the support and assistance of the local organizations resulted in approval on the second try. The project was sponsored by the Decatur Sanitary District.



● PUBLIC relations program was a big factor in selling this sewer line.

PFT Floating Covers and Waste Gas Burner eliminate odor nuisance at Conshohocken.



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Sewage plant next to residential area eliminates odor with modern PFT equipment

In planning their new sewage treatment plant (completed 1954), Conshohocken's engineers faced a special housekeeping problem: the nearest taxpayer's home would be 100' from the digesters. To avoid any possible odor nuisance, the city adopted PFT equipment for "Controlled Digestion" which now operates harmoniously in a residential area.

The two 50' digesters are equipped with PFT Floating Covers for posi-



In the well planned Control Room are (1) PFT Heater & Heat Exchanger, (2) six PFT Gas Pressure Gauges, (3) two Supernatant Selector & Gauge units.

tive scum submergence and safe utilization of gas. The snug fitting covers eliminate odor problems and reduce explosion hazards—gas collected under the dome is maintained at positive pressure under all operating conditions. Capacity is highly flexible because no fixed levels need be maintained; covers simply rise or lower with additions and withdrawals.

As further protection from odor, a PFT Waste Gas Burner (see illustration above) safely burns all excess gas produced in the digesters.

The plant's heating system is equally modern. A PFT Heater & Heat Exchanger (500,000 B.t.u. per hr.) maintains close temperature control of the digesters *automatically*. Fired by gas or oil, it cuts fuel costs by utilizing all gas produced in the digesters.

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Congratulations to Conshohocken—another good example of how a well-equipped plant can become an agreeable neighbor.

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are further treated with these wastes. Sludge is removed to a tank truck. Operating results have fulfilled expectations.

"Pretreatment of Metal-Finishing Wastes at Raleigh, North Carolina." By J. M. Roberts, Consulting Engineer, Atlanta. *Sewage and Industrial Wastes*, April.

Monitoring Organic Atmospheric Gases

To follow changes in the level of organic substances in the atmosphere and their relationship to smog conditions, investigations were conducted to devise a method of analysis which would be continuous. Of instrumental methods previously used, those utilizing infrared absorption appeared to be most promising, and the Model 70 spectrometer developed by Shell Development Co. and manufactured by Applied Physics Corp., Pasadena, was chosen for the investigations. It was found necessary to modify the instrument to increase the sensitivity (beyond the 500 ppm propane at full scale) of the instrument by incorporating longer sample cells (290 cm). Several series of experiments were run to determine the

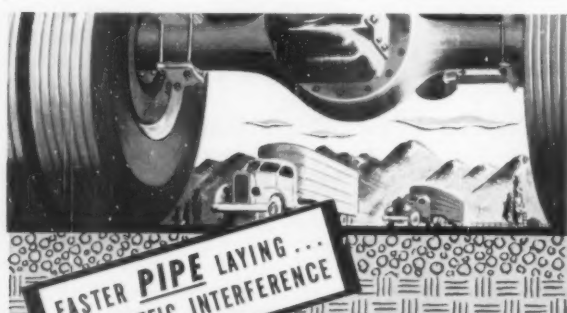
composition of gases in the detector cell most suitable for detecting trace elements in the atmosphere. Propane was selected on the basis of a good hydro-carbon-to-water ratio and satisfactory sensitivity. Studies further revealed that a concentration of 5% propane in argon was best for the concentration of the sensitizing gas in the detector cell. The extent of interference from carbon dioxide and carbon monoxide was found to be slight. The effect of water vapor was overcome by utilizing the compensation afforded by the reference cell, using "burned" air as a blank. The metal shutter was replaced with one of polyethylene. The instrument was calibrated with butane. The freeze-out trap was omitted completely after a trial in which it was found that it introduced an error. Unless the composition of the organic material in the atmosphere is known, its concentration must be expressed by reference to a standard, such as butane.

"Infrared Spectrometric Method for Monitoring Gaseous Organic Substances in Atmosphere. By F. E. Littman and J. Q. Denton, Stanford Research Institute, Pasadena, California. *Analytical Chemistry*, June.

Identification of Ozone in Smog

The presence of ozone in the Los Angeles atmosphere had been suspected since 1951, occurring in high concentrations coincidentally with the "smog." Specific identification of the oxidant was attempted through the employment of three different techniques: rubber cracking, direct spectroscopic measurements, and isolation and identification by spectroscopic and chemical tests. Even though there was good correspondence of the three methods, there was not absolute proof that the oxidant was ozone. Consequently a technique was employed which utilized silica gel at the temperature of liquid oxygen for the concentration of ozone. The gases thus adsorbed were flushed into an optical cell and the ultra-violet spectrum was recorded. By comparing the spectrum with that of synthetic ozone-oxygen mixtures, it was concluded that ozone was identified. Thirty to forty-five per cent of the total quantity of oxidant was accounted for in this manner.

"Identification of Ozone in the Los Angeles Atmosphere." By F. E. Littman and C. W. Marynowski,



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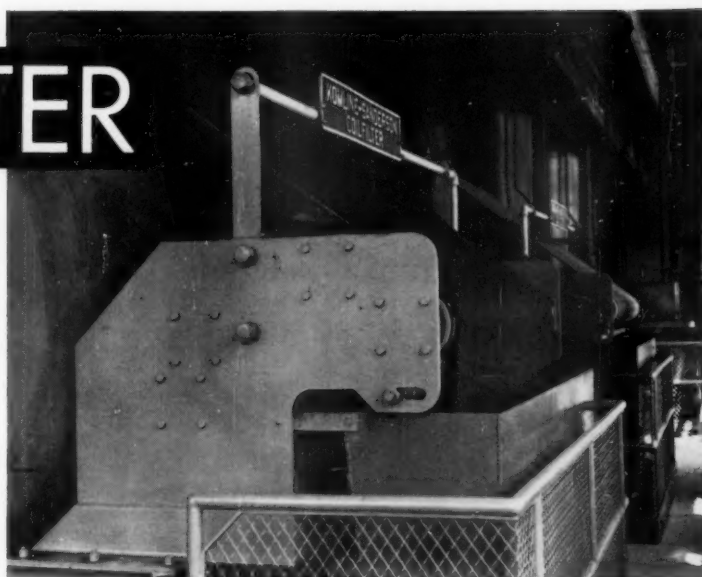
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Central Plant: Design Conditions; Population 60,000. Average Daily Flow 5.15 MGD. Maximum Daily Flow 10 MGD. Two 100 Sq. Ft. COILFILTERS.

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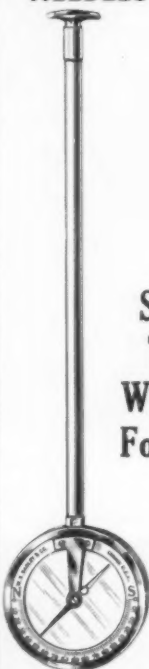


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Stanford Research Institute, Menlo Park, California. *Analytical Chemistry*, May.

Treatment of Petro-Chemical Plant Waste

The location of the chemical processing plant for National Petro-Chemicals Corporation of Tuscola, Illinois, is such that it must be self-sufficient for utilities. Engaged in the production of butane, propane, natural gasoline, ethyl alcohol, ethyl chloride and polyethylene, the company had an effluent disposal problem complicated by the factor of an almost dry wasteway with the plant located at the headwaters of the Kaskaskia River. Materials entering the chemical plant effluent were mineral acids, nitrogen compounds, oxidizable organic material and lubricating oils. Early experience with treatment of the waste, involving only clarification and neutralization, aside from Imhoff tank and trickling filter treatment of the sanitary wastes, resulted in extensive lift-station and piping damage. In-plant corrective action was initiated, which provided improvement, but still permitted discharge of a waste with a BOD higher than the river could tolerate. The possibility of using trickling filters was investigated, and it was found that 80 percent reduction in BOD was possible at high loadings (up to 1.48 lb. per day per cu. yd.) when ammonium nitrate was added. Additional studies were made concerning the use of oxidation ponds, seeded with sanitary sewage and treated with sodium nitrate. Based on preliminary results, it was decided to provide this method of treatment on a full scale. Satisfactory results have been obtained with a loading of 75 lb. of BOD per acre per day. The waste treatment plant as completed in 1955 consisted of in-plant cooling and settling basins, a neutralization and clarification basin (upflow type), and oxidation ponds. The sanitary waste was treated in an Imhoff tank and trickling filter before being mixed with the chemical plant waste for oxidation pond treatment.

"Petro-Chemical Waste Treatment Problems." By G. E. Montes, D. L. Allen, and Edward B. Showell, National Petro-Chemicals Corporation. *Sewage and Industrial Wastes*, April.

Other Articles

"Radioactive Waste Disposal at Hanford" Atomic Products Operation. Outline of disposal and control program.

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By Royal E. Rostenbach, of Gen'l Electric Co. Sewage and Industrial Wastes, March.

"Effect of Metal Finishing Wastes on Sewage Purification." By A. E. J. Pet-tet, of English Water Pollution Re-search Laboratory. Surveyor, May 5.

• • •

What A Parking Meter Returns

In order to determine just how extensively parking meters are being used in Alabama, the Alabama League of Municipalities has just finished a survey which discloses interesting facts. There are 99 communities in Alabama classified as cities—as municipalities with 2,000 or more population. Of these 99 cities, 88 answered the questionnaire sent out by the League. Of the 88 furnishing the League information, 55 have installed and are now operating meters; 33 do not use parking meters. Here's how the use of meters ranges among the various population classes:

Cities of 2,000 to 5,000—20 of 45 cities have them; cities of 5,000 to 10,000—17 of 23 cities have them; cities of 10,000 to 25,000—13 of 15 cities have them; cities above 25,000—all five cities.

The 55 cities that have installed and are using parking meters have a total of 20,096 in operation. Thirty of the cities selected the automatic meters for their meter program and 25 chose manually-operated meters. A nationwide parking meter survey made in 1952 disclosed that at that time there were a total of 1,113,000 meters in use in 2,800 municipalities. They grossed that year \$76,000,000. In Alabama, in the 55 cities using 20,000 meters the annual gross is \$1,000,000.

The average annual income for each parking meter in use in Alabama is just a few cents under \$50, but the receipts vary according to population class, as is to be expected. The survey shows these results from its recently-conducted study in this connection:

1. Average annual income for meters in cities of 2,000 to 5,000 population is \$39.48; 2. Average annual income for meters in cities of 5,000 to 10,000 population is \$41.76; 3. Average annual income for meters in cities of 10,000 to 25,000 population is \$52.20; and 4. Average annual income for meters in cities of more than 25,000 population is \$77.76.

The survey also showed that cost of maintaining parking meters is negligible in practically all cities reporting. In other words, once the meters are paid for, their gross annual income is almost the same as net profits from their operation.

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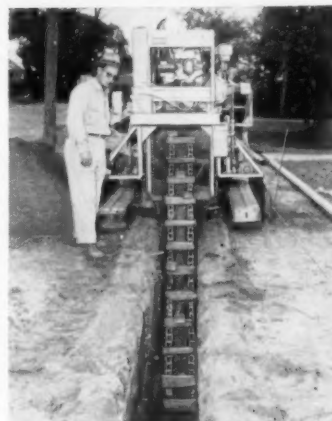
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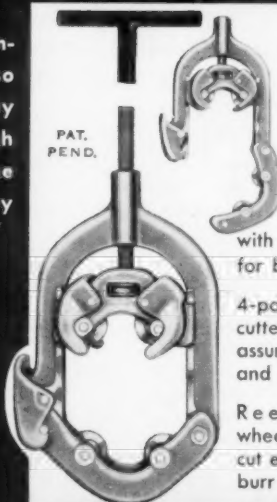
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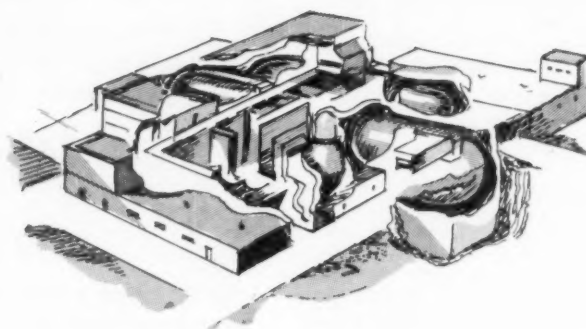
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SANITATION, HYDROLOGY AND NUCLEAR DEVICES

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RELATIVITY BETWEEN three seemingly heterogeneous subjects—hydrology, sanitation and nuclear devices is not too apparent at first glance. A simple definition of each, however, will serve to bring them into focus and stimulate one's imagination toward developing a number of both interesting and important relationships. Hydrology may be defined as the science dealing with the physical properties, occurrence and movement of water in the atmosphere, on the surface and in the outer crust of the earth; sanitation is concerned with the establishment of environmental conditions favorable to health; and a nuclear device is any machine, along with its fuel, that will convert matter into energy by means of a nuclear reaction.

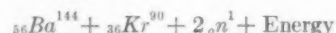
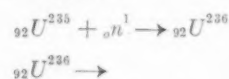
Consideration of the movement of water through the hydrologic cycle

illustrates the coincident nature of the fields of hydrology and sanitation; especially when it is brought to mind that the latter field is classically related to the air we breathe, the water we drink, and the food we eat. Just as the movement and distribution of water depends upon its gaseous, liquid and solid environment so the health of man is subject to his similar material environment. The relationships between hydrology and sanitation may extend from those involved in a rural rainwater-cistern type of individual water supply to those presented on an international basis by usage and pollution of a river such as the Rio Grande. In fact, this relativity has become increasingly global in nature with the introduction, development and utilization of nuclear devices and subsequent contamination of the air, land and sea

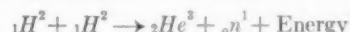
by radioisotopes. There are three types of nuclear devices of which we are generally cognizant and which give rise to quantities of unwanted and hazardous radioisotopes.

Nuclear Weapons

First are the atomic bombs, nuclear weapons in which a fission process is employed to convert matter into energy; e.g.,



The detonation of such a weapon is manifested by the physical phenomena of light, heat, blast, instantaneous nuclear radiations and residual radio-activity. The energy output of such a device is normally rated in kilotons of TNT equivalent. Second, are the hydrogen bombs, weapons that use an atom bomb as a detonator to furnish a temperature of the order of several million degrees centigrade, which is necessary to initiate the interaction of hydrogen nuclei in a fusion process:



Since this reaction is a nuclear one, but requires thermal effects such as high temperatures to activate the process, it is spoken of as a thermonuclear reaction and the weapon is an atom bomb surrounded by hydrogen bearing materials (like hydrides of lithium) in which the hydrogen atoms are the heavier isotopes, deuterium and tritium. The detonation of a thermonuclear weapon is likewise accompanied by light, heat, blast, nuclear radiations and residual radioactivity and, as in the A-bomb, the magnitude of each of these phenomena is proportional to the energy released in the process. For H-bombs, energy ratings are in megatons. The third, and far more

Table 1^(a) —Maximum Permissible Concentration of Fission Products

Fission Product	Selected Critical Organ	μc In Total Body	$\mu\text{c}/\text{ml}$ of Air	$\mu\text{c}/\text{ml}$ of Water	mg/l in Water
Rb ⁸⁶	Muscle	60	4×10^{-7}	3×10^{-3}	4×10^{-8}
Sr ⁸⁹	Bone	2	2×10^{-8}	7×10^{-5}	3×10^{-9}
Sr ⁹⁰ + Y ⁹⁰	Bone	1	2×10^{-10}	8×10^{-7}	2×10^{-9}
Y ⁹¹	Bone	15	4×10^{-8}	0.2	8×10^{-6}
Nb ⁹⁵	Bone	90	4×10^{-7}	4×10^{-3}	1×10^{-7}
Ru ¹⁰⁶ + Rh ¹⁰⁶	Kidneys	4	3×10^{-8}	0.1	1.5×10^{-5}
Ag ¹¹¹	Livers	36	3×10^{-5}	4	3×10^{-5}
Te ¹²⁷	Kidneys	4	1×10^{-7}	3×10^{-2}	1×10^{-6}
Te ¹²⁹	Kidneys	1.3	4×10^{-8}	1×10^{-2}	2×10^{-7}
I ¹³¹	Thyroid	0.3	3×10^{-9}	3×10^{-5}	2×10^{-10}
Xe ¹³³	Total Body	300	4×10^{-6}	4×10^{-3}	2×10^{-8}
Cs ¹³⁷ + Ba ¹³⁷	Muscle	90	2×10^{-7}	1.5×10^{-3}	9.5×10^{-6}
Ba ¹⁴⁰ + La ¹⁴⁰	Bone	5	6×10^{-8}	2×10^{-3}	2×10^{-8}
La ¹⁴⁰	Bone	24	1×10^{-6}	1	2×10^{-6}
Pr ¹⁴³	Bone	29	7.5×10^{-7}	0.4	6×10^{-6}
Ce ¹⁴⁴ + Pr ¹⁴⁴	Bone	5	7×10^{-9}	4×10^{-2}	6×10^{-6}
Pm ¹⁴⁷	Bone	120	2×10^{-7}	1	1×10^{-8}
Sm ¹⁵¹	Bone	420	1×10^{-8}	0.2	6×10^{-8}
Unknown Mixture			1×10^{-9}	1×10^{-7}	

(a) From Handbook 52, National Bureau of Standards, U. S. Government Printing Office, March 20, 1953.

sensible device, is the nuclear reactor in which fissionable material (fuel) is used to produce heat, radiations and radioisotopes at controlled rates.

Nuclear Explosions

The energy released in an explosion of a nuclear weapon is sufficient to vaporize and heat to incandescence all of the fuel, the fission products, the bomb casing and components and the radioactive materials produced by neutron bombardment of the medium surrounding the bomb at the time of detonation. This incandescent mass called the fireball starts skyward shortly after it is formed and at the same time becomes diluted with air, water and dirt from the ground and space between the ground and point of detonation. The fireball then appears as the frequently described mushroom-shaped atomic cloud, the internal portion of which is still extremely hot, but cooling as it ascends. When the vaporized components of the cloud cool sufficiently they will condense or solidify. This process generally takes place on the unvaporized material such as the dusts which were sucked into the cloud during ascent. The solid particles, whether they are radioactive or not, will be removed from the rapidly rising cloud by the cross winds at various altitudes. The precipitation of these particles is known as "fall-out." The extent and nature of this fall-out is determined by such factors as altitude of the burst, medium in which the bomb was detonated (air, water or earth) and the meteorological conditions.

In discussing atomic bombs it has generally been considered that the fall-out from an air burst gives rise to relatively little radiological hazard, whereas the fall-out from a surface burst might constitute a serious hazard at some distance from the explosion and a subsurface explosion would present a serious radiological hazard near ground zero. On the other hand, the fireball from an H-bomb is several miles in diameter and will intersect the earth's surface with resultant production of extensive contamination. Consequently the fall-out from a thermonuclear type of device will constitute a serious radiological health hazard for a few hundred miles downwind due to external radiation exposure. Long range fall-out may contaminate drainage basins half a world away with resultant treatment problems related to industrial and domestic water use.

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development of nuclear reactors to provide electric power, we must consider this third class of devices as the most likely source of radioisotopic pollutants. In addition to the industrial hygiene problems attending the operation of nuclear reactors there are two sanitary problems of hydrologic significance: first, is the possibility of a nuclear incident in which all of a reactor's radioactive materials are dispersed into the air. Second, as with the nuclear weapons, the operation of nuclear reactors results in the production of radioactive fission products. In a quantitative prospectus on fission products from nuclear reactors, Terrill, Moeller and Ingraham⁽¹⁾ estimated that 90 million gallons of liquid radioactive wastes will be produced daily in processing "spent" fuel from new power reactors built during 1964 alone and the concentration of radioactivity in this waste will be about 10 millicuries per gallon, (2.6 microcuries per milliliter). This value compared with the maximum permissible concentration for continuous exposure in air and water, Table I, adds to the significance of the statement by Wolman and Gorman⁽²⁾ that the future growth of the atomic energy industry from the developmental stage to that of applied use of its products may well hinge on our ability to find increasingly effective and reasonably economical methods of disposal of the resultant hazardous waste products. It is obvious, from the data presented in Table I that prevention of the ingestion or inhalation of fission products and their subsequent deposition in the tissues of the body is a problem of major importance. Comparison of maximum permissible concentrations for fission products in drinking water with the total quantity of fission products to be yielded by reactors readily reveals that dilution alone cannot be considered as a long range method for disposition. Dilution of the 1964 estimated production of liquid radioactive wastes with the entire flow of the Mississippi River would not suffice to reduce the fission product concentrations to the levels given in Table I.

To emphasize further the need for adequate nuclear waste disposal to protect the waters of the earth, we may well consider that it has been predicted that facilities to produce an additional 1,000 billion kilowatt hours of energy annually will be built during the next 25 years³. It has also been predicted that peaceful uses of the atom will advance so far in the next ten years that at least

ten percent of all new electric power plants may be using atomic fuel⁴.

Past Experiences

Scores of reports on environmental contamination with fission products and plutonium or uranium debris from bombs or reactors may be found in the literature. A few of these are cited here to illustrate the foregoing. Probably the earliest report on long range fall-out was given by Webb⁵ who reported on the fogging of photographic film by radioactive contamination. Following the "Trinity" detonation near Alamogordo, New Mexico, on July 16, 1945, Webb stated that a radioactive contaminant was encountered in strawboard material used by the Eastman Kodak Company for packaging photographic films. The strawboard was produced on August 6, 1945 at a Vincennes, Indiana mill on the Wabash River. X-ray film packed with this board showed fogged spots after about two weeks exposure. Measurements of the contaminated spots indicated all beta activity (no alpha), thus ruling out the presence of naturally radioactive material. Radiological analysis of the contaminant showed it to have a half-life of about 30 days, a maximum energy of 0.6 Mev, and to come from elements of the rare earth series. This evidence was believed sufficient to prove that the contaminant originated from the Trinity detonation and was deposited as fallout in the Wabash River.

In 1951 Meinke⁶ reported on the occurrence of radioactive snows at Ann Arbor, Michigan, following the January 27, 28 and February 1, 2, and 6, 1951, atomic explosions at the Nevada Proving Grounds. Measurements conducted by Santomauro⁷ between February, 1951, and November, 1952, showed that nuclear weapon tests at Nevada, Eniwetok and Montabello were followed one, two, and three weeks later by an increase in the radioactive contents of rain and snow falling in Italy. The amount of radioactivity over the Parisian area increased with the Nevada tests of March to June, 1953, and the Russian tests of September, 1953, according to Abribat and Pouradier⁸.

Kilcawley *et al.*⁹ reported a study made on the radioactivity of rain and of the water in several reservoirs in the Troy, New York, area from May 15 to August 31, 1953, following the detection of considerable rain-out during a storm on April 26. The reservoir waters usually contained a beta activity of 10 to 100 μc per l as compared to a beta activity of 200 to 30,000 μc per l in the rain. Decon-

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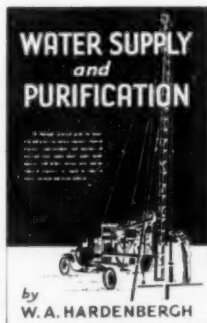
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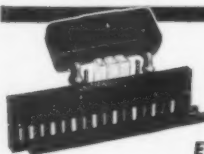
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tamination of the Canadian reactor at Chalk River after an accident in which it released several thousand curies of fission products was described by Gilbert¹⁰.

Future Consideration

To date the disposal of nuclear wastes, gaseous, liquid or solid, has followed two divergent paths—"CC" which means concentrate and confine and "DD" dilute and disperse. Both principles have their shortcomings. DD in that it may eventually lead to contamination of more and more of the earth's waters to the point where the rates of radioactive decay cannot keep up with the discharge of new radio-contaminants. The alternate method CC is very costly, both for the initial chemical and physical processing to obtain concentration and for the confining vessels to hold the concentrated "gunk." Concentration costs currently run as high as \$0.50 to \$1.50 per gallon and storage tank capacity costs about \$0.40 per gallon. The magnitude of these figures becomes impressive upon finding that the Hanford plutonium works already has more than 60 million gallons of storage capacity in their tank farms. Unfortunately, the expense does not stop with simple storage, since these tanks must be monitored at various intervals depending upon the nature of their radioactive contents. In some cases the time required to reduce the contents of a tank to safe discharge levels will run into milleniums. And yet, it is difficult to find engineering records of liquid storage tanks in good condition after only 50 years let alone 50 thousand years.

Reduced to basic concepts we must come to the realization that man-made mutations of the 100-odd chemical species involve nuclear reactions that, unlike ordinary chemical reactions, often require 10^3 , 10^6 , or even 10^9 years for reversion. Furthermore, the rate of production of these radioisotopes is or will soon become significant on a global basis. Considering that our planet has a radius of only 4,000 miles, a crust thickness of about 25 miles, (three-fourths of which is under water) and is contained in a gaseous envelope having an effective thickness of only 5 miles it is suggested that the sanitary problems attending the use and development of that mixed blessing we call "atomic energy" be approached on a global basis. Inasmuch as water is the most abundant and most essential substance involved in all living, industrial, and cultural processes, the sanitary and

hydrologic aspects will be of utmost importance.

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Expressway Maintenance Scheduling Procedures

Expressway maintenance in Wayne Co., Mich., is scheduled so that all lanes of the expressway are kept open for rush-hour traffic. Excepting for emergency work, all maintenance is performed between 9 AM and 4 PM, Monday through Friday. All road sweeping operations are carried out on Sundays, beginning at daylight. It is proposed that all traffic line marking will also be done on Sunday to avoid the congestion that occurred last year.

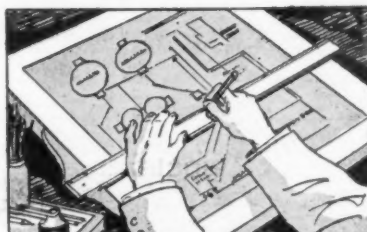
All trucks and pickups used for patrol maintenance on the expressways are radio-equipped and there is a tie-in with the Police Department. When a traffic lane must be closed, warning signs are spaced a mile and a half mile from the job to give drivers ample warning.

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Will the Rebeccas Ride Again?*(Continued from page 112)*

companies to build and maintain roads and to collect tolls to finance them. For the next two centuries, toll roads were built by this means all over the United Kingdom and stockholders of these companies earned liberal dividends on their investments.

One of the foremost engineers for these turn-pike companies was John Metcalf, who was totally blind. His contribution to road-building was his insistence on improved drainage by a solid foundation and a high crown. Another was William MacAdam, who devised a crushed rock surface which bears his name.

By 1829, 1100 turn-pike companies had built 20,000 miles of toll roads in England. This compares with the 50,000 miles of surfaced highways in the Roman road system which spread all over Europe.

But there was resentment among persons in some parts of the country, particularly in South Wales, at having to pay tolls on the highways. The protesters thought the tolls were much too high and yielded too large a profit to the turn-pike companies. So in 1839, bands of night-riders, the "Rebeccas," tore down the toll gates and toll-houses but inflicted no harm on the toll-keepers and their families. The exasperated government finally called out troops who broke up the movement; but the trouble was remedied by removing the tolls or regulating them more strictly in this part of the country.

This plan of financing highway construction by private enterprise was brought to the New World. The first hard-surfaced toll road in this country was the Lancaster Pike which ran 65 miles out of Philadelphia. This macadam highway was constructed in 1792 by a stock company at a cost of \$463,000. The tolls yielded a 15 percent dividend to the stockholders for many years. Many other companies were formed in the early 19th century which built highways in the Eastern states; but, as in England, travellers were not happy at paying tolls. In Northern Ohio there was the Shun Pike running parallel with the toll road which permitted wayfarers to "shun" it. There was one toll highway project in early America which was much too big for any private turn-pike company to finance. This was the projected interregional National Highway from Washington across the mountains to the Mississippi River at St. Louis. This high-

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way had two purposes. It had a military value for moving troops and supplies to the Mississippi and Ohio River valleys; also, it was to serve to carry emigrants and supplies to help build up the great interior.

This highway was financed by the federal government from the proceeds of the sale of public lands. Originally planned in 1803, construction was not actually started until 1811 and was interrupted by the war with England. By 1819, however, this great highway was constructed westward to the Ohio River at Wheeling, W. Va., where water transport could be obtained.

The surfacing consisted of small stones pounded to a solid mass. At fairly regular intervals there were toll houses. Higher tolls were charged vehicles having wheels with narrow tires because of the greater damage these did to the surface.

For the next 30 years, until the canals and railroads denuded the highways of vehicles and travellers, the National Highway, now U. S. Route 40, was filled with a stream of horse-drawn conveyances, most of them moving westward. There were the billowy Conestoga wagons carrying emigrants and their goods; the gaily-painted stage-coaches of the National Stage Lines with their fancy names like modern Pullman cars, and the freighters with their wagons piled high with building materials bound for the new communities in the interior.

After a few years' operation by the federal government, a court decision ruled that it had no right to collect tolls, so it turned the long highway over to the various states through which it passed.

Then came the railroads and the main highways were almost deserted except for the farm-to-market travellers. But the old Pike didn't die. Now, a century later, travellers again are back on the highways, whizzing from city to city, state to state and ocean to ocean. Many miles of new roadway are now being constructed, much of it of the toll-road type.

Water Meters in Service

The Water Department, Toledo, Ohio, had 98,400 water meters from ½ to 1-inch, in service at the end of 1955. The city owned 80 percent of these meters while the other 20 percent were privately owned. There was an increase of 2958 water meters during 1955 over 1954. The cost of meter repair amounted to \$29,062.10 for the year.

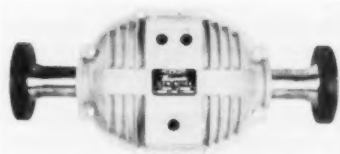
PUBLIC WORKS EQUIPMENT NEWS

Published Monthly

July, 1956

Magnetic Flow Meter For One-Inch Lines

Previously limited to a minimum line size of 2 inches, the Magnetic Flow Meter, announced by Foxboro, is now available for 1-inch flow lines. The smaller meter offers all the advantages of the larger instruments (2-inches and up); namely, over-all accuracy of 1 percent of full scale throughout the entire range, no restriction of flow, linear flow readings, performance unaffected by pressure, viscosity, density or changes in conductivity of the flowing liquid. The unit consists of a nonmagnetic flow tube with an insulating liner containing flush-mounted metallic electrodes and surrounded by an AC electromagnet. When a conductive liquid passes through the tube, an alter-

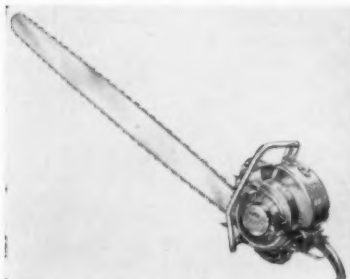


New magnetic flow meter in 1-in. size

nating voltage is set up between the electrodes which varies linearly in proportion to the rate of flow. Lead wires from the electrodes transmit this voltage output to a Dynalog Recorder, producing a chart record in appropriate units of flow. Complete information from The Foxboro Co., Foxboro, Mass., or circle No. 7-1 on the reply card.

Lightweight Chain Saw

A new one man chain saw that will bring down even very large trees has been announced by Homelite. The new Model 7-29 delivers 7 hp, yet weighs only 29 pounds. Perfectly balanced, it is light enough to carry through the roughest terrain and cuts in any position. Straight blade guide bars are available in sizes from 18 up to 72 inches and plunge cut bow guides are available in 14 and 18-inch sizes. For further information write Homelite, 75 Riverdale Avenue, Port Chester, New York or circle No. 7-2 on the reply card.



Chain saw delivers a full 7 hp, weighs only 29 pounds and is very easy to use

All Purpose Reflective Sign Finish

A late development in sign reflectorizing material is Prismo "200" Hi-Reflective finish. This new sign finish can be easily applied by brush, roller, silk screen, coater or any type of spray directly on the sign blank. Any shape, size or surface that can be painted can be reflectorized with Prismo "200", which gives a uniform coating to porous and non-porous surfaces alike. It is effective in daylight, and has long range "punch" at night. An exclusive feature is its built-in "Moisture-Pruf" ingredient that repels water so the signs have hit-target flash in bad weather conditions. Complete information is available from Prismo Safety Corporation, Huntingdon, Penna., or circle No. 7-3 on the reply card.

Pugmill For Stabilization Mixes

A high-capacity mixing pugmill, especially designed for the needs of the stabilization mixing field, has been announced by Barber-Greene. The 350-ton per hour (and higher)

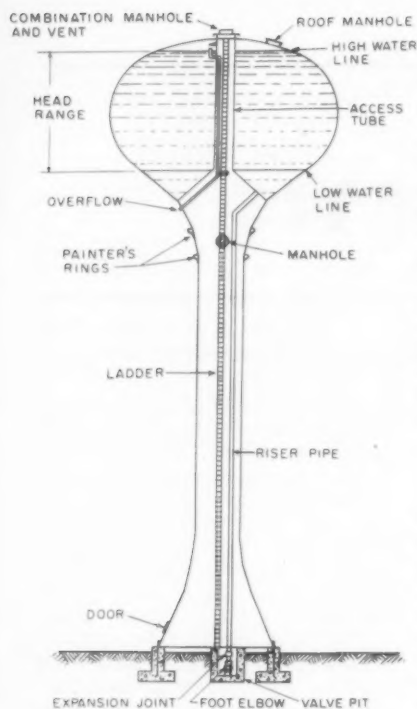
capacity of the twin-shaft pugmill promises lower job costs through quicker completion. Thorough mixing of the material is assured by the twin-shaft pugmill, and through the use of a hydraulically controlled, 5-cu. yd. discharge hopper which serves as a dam to control the height of the material in the pugmill and the duration of the mixing time. Designed for use with cement, calcium chloride and other water-mixed stabilizing agents, the pugmill is equipped with water spray bars and an accurate meter-centrifugal pump combination which



can supply as much as 150 gal. per min. to the pugmill. Additional information may be obtained from Barber-Greene Co., 400 N. Highland Avenue, Aurora, Illinois, or circle No. 7-4 on the reply card.

Plaster and Mortar Mixers

The new Essick mixer line offers 21 different models in the four basic sizes of 4, 6, 8, and 12-cubic foot batch capacities. The mixers all feature added horse power, faster spiral mixing action, no greasing, improved shaft seals, easily accessible engine housing, bag splitters, safe portability, heavy duty clutch, low charging heights, and rubber scraper blades. There is a mixer model that meets the requirement of any job size. For more information circle No. 7-5 on the reply card or write Essick Mfg. Co., 1950 Sante Fe Ave., Los Angeles, Calif.



Waterspheroid proportions showing the internal riser, ladder and access tube

Single-Column Spheroidal Water Towers

Chicago Bridge & Iron has extended the capacity of the single-column water tower from the 250,000-gallon limit of the standard Watersphere up to 500,000 gallons by a new form and construction for elevated tanks. The flattened sphere (spheroidal) shape permits use of larger tank sizes without excessive head range or difference in height (and therefore delivery pressure) between high water and low water in the tank. The head range of the 500,000 gallon Waterspheroid (59-ft. in diameter) is, for example, only 30 ft., the same as the head range of a 150,000-gallon Watersphere (only 34 ft. in diameter). The principal benefits of the design include: (1) less land area needed; (2) less exposed surface with resultant savings in both heating cost and painting costs; (3) sweeping lines which fit in more beautifully with landscaping and natural surroundings; (4) wholly enclosed inspection-access; (5) the ability to house pumping and valving equipment within the flared base of the column; (6) total elimination of external ladders; and (7) smooth surfaces from top to bottom. Standard sizes of Waterspheroids are now 250, 300, 400 and 500 thousand gallons with alternate ranges in head for the 400 and 500 thousand gallon sizes. Heights

to tank bottoms range from 50 to 125 feet. Internal construction of the Waterspheroid is similar to that of the Watersphere, with a cylindrical steel core atop a transition cone connecting the hollow supporting column to the manhole and vent at the top of the tank. Ladder, riser, overflow stub, and heating and insulation facilities (if required in cold climates) are still within this unobstructed central shaft from ground to finial. For further details write Chicago Bridge & Iron Co., McCormick Bldg., Chicago 4, Ill., or circle No. 7-6 on the reply card.

Portable Gasoline Tamber

Introduction of a new portable, gasoline powered compaction tool, that is used for construction and maintenance work by contractors and municipalities has been announced by Barco. This compactor combines positive impact, imparted by high speed rotating counterweights, with intensive vibratory effect to produce maximum compaction of granular fill materials and bituminous surfacing. It has many uses: tamping and finishing bituminous paving in restricted areas on walks, driveways and courts and for hole patching; compacting sand or earth fill in areas bearing footings, paving or floor slabs; tamping work inside buildings; and trench grade leveling. In operation, one man can tamp up to 750 sq. yds. of surface per hour using lifts of as much as

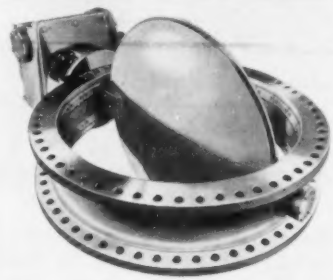


Finishing surface of bituminous paving

12 inches. Power is supplied by a 3-hp, 4-cycle air cooled gasoline engine with speed adjustable from 1600 to 2400 RPM. Convenient handles provide for lifting the tool into a truck or other vehicle and the total weight is 225 lbs. For more details write Barco Mfg. Co., Dept. V-45, 500 Hough St., Barrington, Illinois or circle No. 7-7 on the reply card.

Standard Butterfly Valves

A new series of butterfly valves designed primarily for municipal water supply or disposal systems has been announced by Allis-Chalmers. Suitable for various installations of moderate pressure and pipe-



Butterfly valves for municipal water supply or for sewage disposal systems

line velocity, the new valves meet the recently published tentative standard specifications for rubber and metal seated butterfly valves. Diameters range from 16 to 84 inches and valves with rubber seats in the housing are made for 25 psi and 50 psi ratings. Metal seated valves are made for 25 psi rating and above. For full information write Allis-Chalmers Manufacturing Co., 1189 S. 70th Street, Milwaukee, Wis., or circle No. 7-8 on the reply card.

Centri-Mite Filter

A new space saving filter for commercial and residential swimming pools, the Centri-Mite, is announced by Swimquip. The Centri-Mite diatomaceous earth filter No. 2304, occupying only two square feet of floor space at its base, and standing four and one-half feet high has 10 square feet of filtering area, enough capacity for a 20 x 40-foot pool. Accessibility and general simplicity of cleaning the filter element are advantages. Centri-Mite Filters No. 2308 and No. 2312, incorporating two and three filter elements respectively, proportionately increase filtration capacity to 20-ft. and 30-ft., while maintaining a minimum space for the installation. For full details write Swimquip, Inc., 3301 Gilman Rd., El Monte, Calif., or circle No. 7-9 on the reply card.

Auburn Trencher For IHC Tractor

Auburn Machine has converted the IHC 300 utility tractor into a balanced trenching machine. A geared spacer, with all gears running in oil, has been inserted behind the tractor transmission and this



Trencher digs to a depth of six feet

spacer lengthens the wheelbase six inches, puts more weight on the front wheels and makes for smoother digging and straighter trenches. A hydraulic drive provides power for propulsion while digging at any speed up to 600 feet per hour, depending on soil conditions. The hydraulic boom lift operates the digging boom in a 190 degree arc by means of one control level. From one position, the operator has control of clutch, speed of tractor and depth of trench. The new machine is capable of digging trenches 6 to 14 inches wide and up to 6 feet deep. Circle No. 7-10 on the reply card or write the Auburn Machine Works, Inc., Auburn, Nebraska.

Payloader Tractor-Shovel on Crawler Tracks

The Model 12 Payloader, announced by International, is a completely new, rear-engine 1¾-cu. yd. tractor-shovel on crawler tracks. Highlights are: (1) 91½-hp engine in rear; (2) better balance; (3) full power shift transmission and torque converter drive; (4) power boosted steering controls; (5) 40 degree bucket tip-back at ground level; (6) adjustable operator seat; (7) closed hydraulic system with pressure control; (8) 8-ft. 10-inch discharge height and (9) three forward speeds up to 10 mph and three reverse

Temporary and Removable Paint For Traffic Control

Temline, a new paint product that is temporary and completely removable is announced by Traffic Safety Supply. It is applied like ordinary paint to mark or delineate semi-permanent lines that will last as needed up to 5 months. It is available in three colors; white, yellow and neutral gray. The paint dries in 15 minutes or less and removal operation takes about 15 minutes. With this flexibility, changing lines for traffic lanes, safety lines and pedestrian control is made simple. R-14 remover dissolves only Temline paint, and original lines temporarily covered by the paint will be restored after the emergency is past. For further information write Traffic Safety Supply Co., 2636 N. E. Sandy Blvd., Portland 12, Oregon, or circle No. 7-11 on the reply card.

2-Way Portable Radio

A hand-carried 2-way portable radio weighing only 11 pounds, complete with batteries, has just been announced by Industrial Radio Corp. The new Model H/M Pak-Fone features loud speaker operation, re-



This 2-way portable radio weighs only 11 pounds, has loud speaker operation

lay operated squelch system, volume control and on-off indicator light. A power cable connector is also provided for an external power supply and the radio meets all FCC and FCDA requirements for municipal and industrial portable radio requirements. For full details write to Industrial Radio Corp., 428 N. Parkside Ave., Chicago 44, Ill., or circle No. 7-13 on the reply card.

Self Propelled Crane

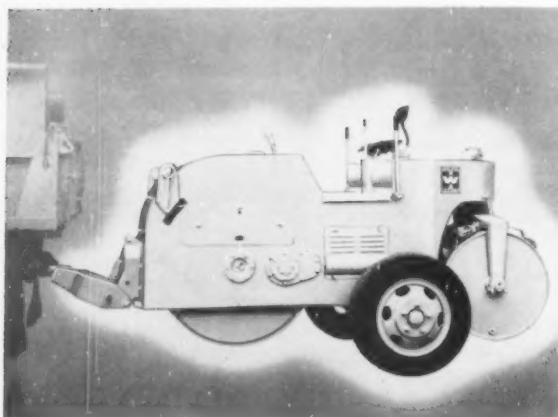
Little Giant Crane & Shovel announces the new ½-yard self propelled yard crane. Features include lower center of gravity, less tipping action, greater safety factor, no hook rollers, greater stability, less maintenance costs, minimum down time and easier swinging. This single engine crane is equipped with hydraulic Servo steering and hydraulic power braking, and the 2-speed, 4-wheel drive eliminates many traction difficulties. The unit will turn in less than a 60-ft. circle, with a 360° vision cab for the operator. For full details write Little Giant Crane & Shovel, Inc., East Sixteenth and Howard Drive, Des Moines 13, Ia., or circle No. 7-14 on the reply card.



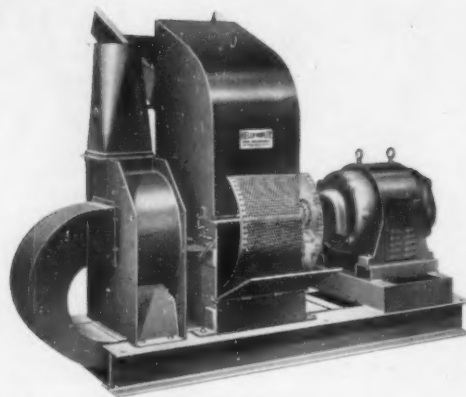
Payloader has top speed of 10 mph forward, 13 mph reverse



Self propelled crane is used for work in cramped quarters



Roller can be changed to portable unit for quick movement



Hammer grinder for sewage sludge and dry industrial wastes

Huber-Warco Tow Attachment For 3-5 Ton Tandem Roller

A towing attachment for its new 3-5 ton tandem roller is now offered by Huber-Warco. This can be supplied mounted on the roller or it may be purchased separately and easily bolted on in the field. It consists of a towing hitch with a built-in hydraulic jack; axle and wheel assemblies; and axle carriers for both working and towing positions. Features of the attachment include 7.50 x 20 tires, wheels mounted on tapered roller bearings and an eight-inch vertical adjustment at the hitch to provide a level travel position for the roller. The new 3-5 ton tandem, itself, features a water-cooled 41-hp engine and a torque converter. Its guide roll assembly has tapered roller bearings—adjustable on the job. For full details write Huber-Warco Co., Marion, Ohio or circle No. 7-15 on the reply card.

Streamlined Asphalt Plant by Madsen

A new, portable batch type asphalt plant designed specifically for the municipality, county and contractor is announced by Madsen Works. Known as the Model 391 Hot Rod, it is built in capacities of 3000-, 4000-, and 5000-lbs. per batch. The plant is extremely clean and simple in design and has a minimum of parts required to be dismantled for transport. It has a fully-enclosed double reduction gear box that goes right into the mixer shafts eliminating need for exposed mixer timing gears. This device accomplishes the reduction from diesel engine or electric motor speed down to mixer shaft speed in a simple free-running, dust-tight, well lubricated manner. The operator platform is located on the end of the plant away from dust,

fumes and heat. Asphalt and aggregate scales and all controls are conveniently located, and the mixer has liner sections which are externally installed and externally removed. Complete data from Madsen Works, Construction Equipment Division, Baldwin-Lima-Hamilton Corp., P. O. Box 38, La Mirada, Calif., or circle No. 7-16 on the reply card.

Heavyweight Traffic Liner

A new line painting machine has been announced by Jawco Products. The removable paint tank holds ten gallons of paint and the paint flow makes it possible for higher operating speeds without air pressure. This machine is hand propelled with gravity feed and brush application. Applicator brushes are readily interchangeable and are available in 4, 6, and 8-inch widths. For further details write Jawco Products Corp., 200-215 Butler St., P. O. Box 1224, York, Pa., or circle No. 7-17 on the reply card.



Traffic liner designed for high speed

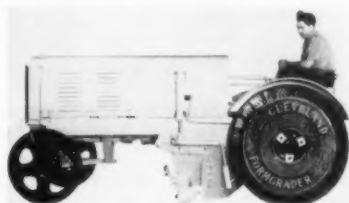
Hammer Grinder For Sewage Wastes

The new Kelly duplex hammer grinder is designed for reducing and pulverizing all types of dry industrial and sewage wastes. All grinding is done in mid-air. Swinging hammers repeatedly strike the material while it is in a state of suspension—and then pass it through a heavy steel screen, which is perforated to any degree of fineness desired. Hammers can be reversed for longer life and screens can be changed in less than 30 seconds without removing the mill cover. It is available in 5 models, with throat openings from 12 to 24 inches and in a motor range from 30 to 150 hp. Grinders can be furnished either with a direct connected motor or with belt drive. For complete information write the Duplex Mill and Manufacturing Company, 711 Sigler St., Springfield, Ohio, or circle No. 7-18 on the reply card.

Power Steering & Hydraulic Controls Features of Formgrader

Latest improvements in the Cleveland Formgrader, a machine that cuts form trenches quickly and accurately for road construction, include power steering, hydraulically operated cutter lift bar and an improved self-starter. This machine will enable one man to cut a form trench to exact grade and in six hours it can cut 6840 lineal feet of trench. Inclusion of power steering adds materially to ease of handling, increases accuracy and requires less attention from operator. The operator simply sees that the line gauge on the left side of the machine follows the guide line running between the construction stakes. As the line gauge on the machine is always

kept level through a pendulum controlled shaft, the form trench is always cut to the proper depth regardless of the unevenness of the ground. The Formgrader uses a heavily weighted drive wheel which



One operator easily cuts form trenches

follows in the path of the cutter blade and simultaneously compacts and rolls the trench ready for instant setting of forms. For more information write Cleveland Formgrader Co., Mills Road, Avon, Ohio, or circle No. 7-19 on the reply card.

Goldak Model L-46 Leak Detector

Savings in time in the location of known water leaks are made possible with the Model L-46 senior leak detector announced by Goldak. The L-46 features a high-gain circuit sensitive through a filter system to the range of frequencies occurring in the average water leak. The detection head is a full two-inch square crystal encased in sponge rubber. The output is used to drive a 3-inch microammeter and an audio indication is produced in a



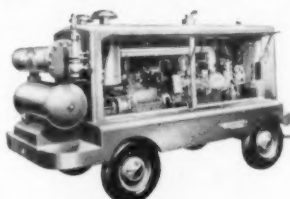
A leak detector for water departments

pair of earphones. The unit is completely self-contained and uses standard portable batteries and miniature tubes. Included are attachments so that the microphone can be used to make readings through dirt, concrete or pavement or on valves, risers and shut-offs. For further details write the Goldak Co., 1544 W. Glenoaks Blvd., Glendale 1, Calif., or circle No. 7-20 on the reply card.



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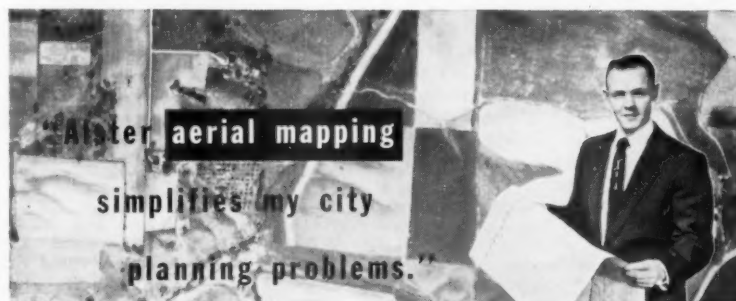


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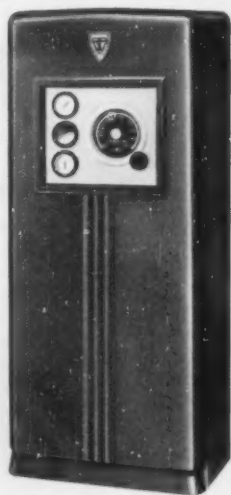
A new 3.5-ton portable roller has just been announced by Littleford. Featuring power steering, the roller is steered by a wheel. Another feature is the hydraulic lift which permits change from trailing-to-rolling-to-trailing positions with a flip of a switch. Trailing wheels need not be removed, since in the rolling position the trailing wheels are 5 inches above the rolling surface. However, the wheels can be removed easily and quickly when necessary as when rolling close to buildings. The Model 160 is powered by a 19.5-hp aircooled engine, and has two forward and two reverse speeds. For information write Littleford Bros., Inc., Box 452P, E. Pearl St., Cincinnati 2, Ohio, or circle No. 7-21 on the reply card.

Auger Attachment Can Dig 40 Ft. Deep

A new auger attachment for use on the Model H-3 and H-5 Hydrocranes is announced by Bucyrus-Erie. The new unit drills holes from 3 to 28-inches in diameter and maximum depth capacity is 40 feet. The attachment consists of the cutter head, 4-ft. auger flight sections, a hydraulic motor and gear box, a torque arm extending from motor bracket to boom and drain hose. Both vertical and horizontal boring jobs can be done. The cutter heads are fitted with long-wearing carbide teeth. For further information write Bucyrus-Erie Co., South Milwaukee, Wis., or circle No. 7-22 on the reply card.

V-Notch Chlorinators Have High Accuracy

The first two models of the V-notch line of chlorinators have been announced by Wallace & Tiernan. The V-notch chlorinators, built entirely with corrosion resistant materials, feature a new metering and controlling principle—the V-notch Variable-Orifice. The chlorinators cover a feed range from 25 pounds per day to 2000 pounds per 24 hours. The series A-712 Wide Range Model features direct reading dial indication of the feed rate with 4 percent accuracy over a 20 to 1 range for any V-notch Variable-Orifice. The series A-711 chlorinator provides a rotameter for feed rate indication, giving accurate control over a 10 to 1 range



Model A-172 V-notch Chlorinator has the Variable-Orifice

for any one rotameter. V-notch Variable-Orifice control gives precise and smooth chlorine feed control over an extremely wide range. The new chlorinators are styled with a two-tone green fiber glass cabinet. Information from Wallace & Tiernan, Belleville, N. J., or circle No. 7-23 on the reply card.

Clear, Mow, Shred Large Areas Twice as Fast

Tractor-propelled, the BMB Twin Brute mower with offset design, cuts a 10-foot swath under limbs and branches and close into corners making it possible for road crews to do all heavy cutting jobs almost automatically. Features include the over-running clutch which gives the operator complete control at all times, and furnishes the additional power needed to maintain

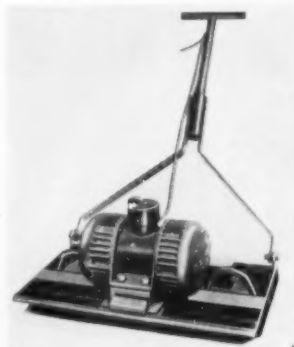


Rotary cutter with an adjustable cutting height of three to fourteen inches

the blade speed while changing gears on the tractor, or while maneuvering in dense and difficult areas. The twin 40-hp gear boxes and twin flywheels furnish momentum, and allow for smooth operation. When obstructions are hit, the blades contract under the flywheels and, when cleared, go back to work automatically. For more information write the BMB Co., Inc., 319-21 New York Avenue, Holton, Kansas, or circle No. 7-24 on the reply card.

Vibratory Compactor and Float

The new Syntron-Sinex vibrating compactor and float has a 30-inch wide weighted float, is powered by 3600 vibrations per minute and is self-propelled. The new unit is useful on road widening and patching, compacting dirt fills, drainage and cover fill in trenches and numerous other building construction and maintenance jobs. Totally enclosed, the electromechanical vibrator mounted on the compactor does not require lubrication and is completely pressure tight and water proof. Detachable weights provide easy handling of the compactor from job to job. Operation from 220-volt, 3-phase current. Write to Syntron Company, 660 Lexington Ave., Homer City, Penna., or circle No. 7-25 on the reply card.



Vibrator useful on road widening, compacting dirt fills

Distributors Desire Sanitary Engineering Products for Middle East

The Sanitary Engineering and Trading Co., Rue Du Port, Rebeiz Bldg., Beirut, Lebanon, wish to represent American firms making the following products, according to a letter from George Chidiac, CE, MSSE, a former student at the University of North Carolina: Water and sewage equipment, chlorinators and incinerators, large, small or unit; sewage pumps to about 8 meters lift for basement installation; insulating equipment for noise abatement, and apparatus and equipment for smoke abatement. Address direct the firm above.

Some Water Works Manuals Are Available to Professors on Request

In publishing the 1956 Water Works Manual, some additional copies were printed for use in colleges by engineering students. Up to 20 copies will be sent to any Professor who requests them and agrees to pay the express collect charges incurred in sending them. There is no other charge. So many colleges are already using these Manuals for supplementary texts that it was decided to make additional copies available. Send your request, with full shipping instructions to The Water Works Manual, 200 So. Broad St., Ridgewood, N. J.

Engineers Needed in VA

The VA has urgent need for engineers interested in design, construction, modernization, maintenance and operation at veterans hospitals. Salaries range from \$4480 to \$7570 a year and low cost life insurance, group hospitalization, medical care plans, liberal leave and retirement benefits are included. Forms are available at post offices and VA hospitals and should be mailed to the Director of Personnel, Dept. of Medicine and Surgery, Veterans Administration, Washington 25, D. C.

Sanitary Engineer Available

A sanitary engineer is available who is experienced in water works operation and management; and in city, county or state sanitary and public health engineering. He has degrees of BS with Sanitary option and MS in sanitary engineering. Address Box 7C, c/o Public Works, 200 S. Broad St., Ridgewood, N. J. Letters will be forwarded.

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-Worth Seeing

Interested guests watch demonstration of the new Gar Wood Speed-Packer at the Dianem Company, Lodi, New Jersey. As municipal officials and private collection contractors look on, tree branches, steel containers, cinder blocks, tires and oak beams were fed into the loading chute and crushed and compacted with the collection unit.



For a sewer line installation in Naples, Florida, this Bucyrus Erie H-3 Hydrocrane with clamshell quickly digs a wide trench.



Familiar sights in foreign lands: Here a Caterpillar No. 12 Motor Grader is helping to build a farm-to-market road in Mexico.

Scale model shows future appearance of 11-block-long "Terminal City" under construction for New York International Airport.



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In pools too wide to be vacuumed from the pool deck, Modern shallow water diving equipment now makes vacuum cleaning a low-cost, one-man operation.

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WORTH TELLING

by Arthur K. Akers

★ WHEN we despair slightly of the human race we go to an A.W.W.A. Convention like the recent one in St. Louis and get our faith rebuilt. The water works breed grows finer with each passing year. We remain soured, however, on union feather-bedding, after having to employ an unwanted card-carrier to unpack our exhibit at an hourly wage closely approaching the Monaco national debt.

★ AN accepted invitation reaches us to be an editorial guest at the Massey-Harris-Ferguson Inc. demonstration at Racine, Wis., June 20 of a new line of four light and medium tractors and integrated attachments.

★ RICHARD V. FORD of the Ford Meter Box Co. was a welcome guest lately at our new offices. He is not only vice president elect of the Water and Sewage Works Manufacturers Association but will also succeed Lou. Frazza of Johns-Manville as director of the Water and Sewage Industry and Utilities Division, in Washington.

★ HIS BANDAGES don't show here, but genial Stanley F. Gotter of Computer Measurements was wear-



ing plenty when this photo was taken, at the St. Louis A.W.W.A. It seems that an Oklahoma native in the car in front of him zigged when he should have zagged, and without signaling. Result, two pre-Convention days in a hospital for Stan.

★ GLENFIELD & KENNEDY Inc., has moved from New York to 706 North Ave., New Rochelle, N. Y. Remember this when you next need a Micro-strainer.

★ JOHN R. HARTLEY keeps earning his way into this column: this time as newly-named general manager of Builders-Providence Division of B-I-F Industries, Providence. He remains also vice president and manager of Project Sales.



Mr. Hartley



Mr. Aycock

★ MILTON H. ("Cotton") AYCOCK is named manager of newly-established Centrine Corporation district office at 57 Forsyth St., N.W., Atlanta.

★ KENNEDY VALVE MFG. CO. announces James R. Erven as vice president and sales manager, promoted from New York branch manager.

★ N. L. BARR has been appointed general sales manager, Asbestos-Cement Pipe Division of Keasbey & Mattison Co., Ambler, Pa.

★ R. A. McQUADE makes a fresh ascent—to sales and advertising manager, Penn Instruments Division of Burgess-Manning Co., in Philadelphia.

★ A. REED WILSON of Kansas City was in New York for lunch again, outlining the merits of his W-B Manhole Adapters to a group of New York City borough and utility engineers. We were there, and our only regret is that Reed's VIP guest list is too long for our space

★ DON'T SMOKE in bed. The ashes you leave may be your own.

—Sparling Metrograms

NEW 360 HALF-YARD HOPTO



DIGGER • SHOVEL • CRANE

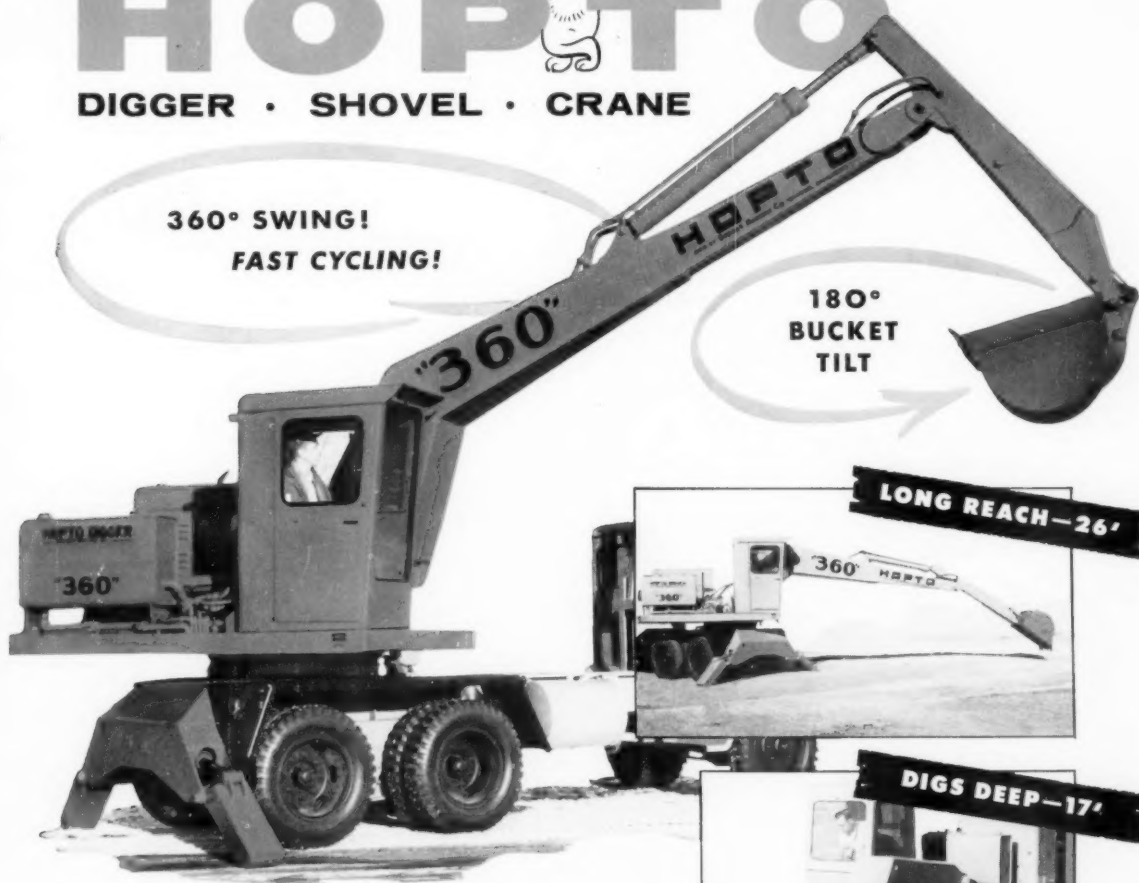
360° SWING!
FAST CYCLING!

180°
BUCKET
TILT

LONG REACH—26'

DIGS DEEP—17'

LIFTS HIGH—12'



Here's the completely hydraulic *mobile* shovel that equips you to do more jobs with lower equipment investment... at greater profit!

The 360 HOPTO swings three hundred and sixty degrees from its over-the-cab travel position. Operator's cab swings with unit for face-forward, *safe* operation. Feather-touch controls actuate every movement from positioning of outriggers to fast-cycling swing and 180° tilt of bucket! Heavy-duty hydraulic system with built-in relief valves gives an easily managed, oil-cushioned, 20 ton force to dipper stick!!!

Interchangeable backhoes and shovel buckets have H and L replaceable teeth and are available in three-eighths and one-half yard sizes. Check *NOW* on the many advantages of owning this work-hungry, mobile digger, shovel, crane!

Write today for complete information on the '360' or any one of six quarter-yard HOPTO Models!



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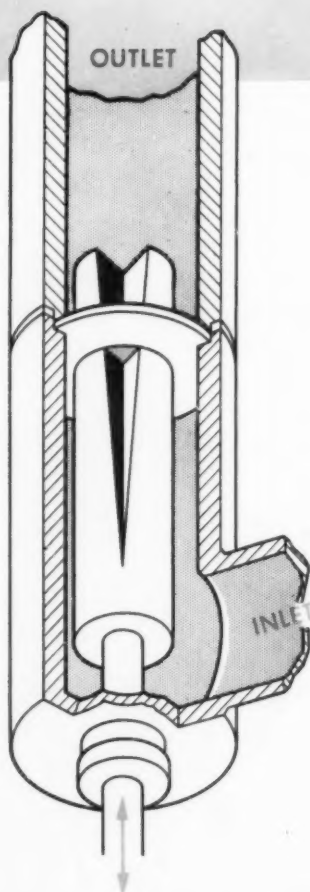


THE WALLACE & TIERNAN

V-NOTCH

variable-orifice

... a new concept for chlorinator control



The W&T V-notch Variable-Orifice is the heart of a new chlorinator control system. With the system, a constant differential vacuum is maintained across the V-notch Variable-Orifice and the flow of chlorine gas is adjusted by varying the area of the orifice.

The W&T V-notch Variable-Orifice has these features:

- Wide range adjustment of chlorine flow
- Excellent reproducibility of flow by a simple adjustment
- Same % accuracy over entire wide flow range

As can be seen in the diagram, the V-notch Variable-Orifice is formed by a cylindrical plug positioned inside a matched, circular ring. A V-shaped groove is machined along the length of the plug. The groove starts near one end of the plug and gradually enlarges to its maximum width and depth at the other end of the plug. The V-notch Orifice is formed at the intersection of the grooved plug and the matched ring. The orifice area is varied simply and positively by positioning the plug backward or forward inside the fixed ring.

The V-notch Variable-Orifice is just one design feature of the new W&T V-notch line of chlorinators. Get all the facts about the W&T V-notch chlorinators before you buy chlorination equipment.



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